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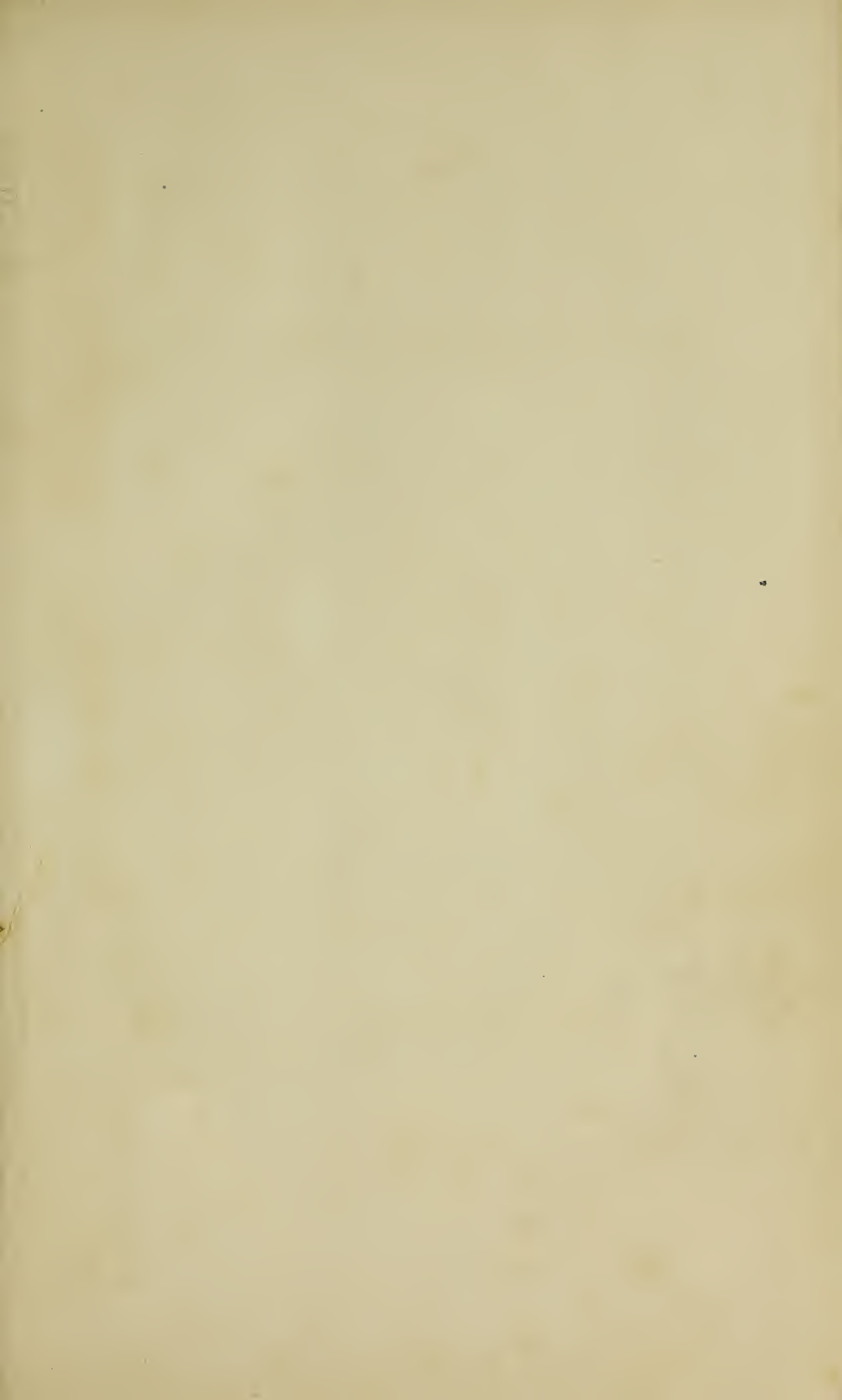
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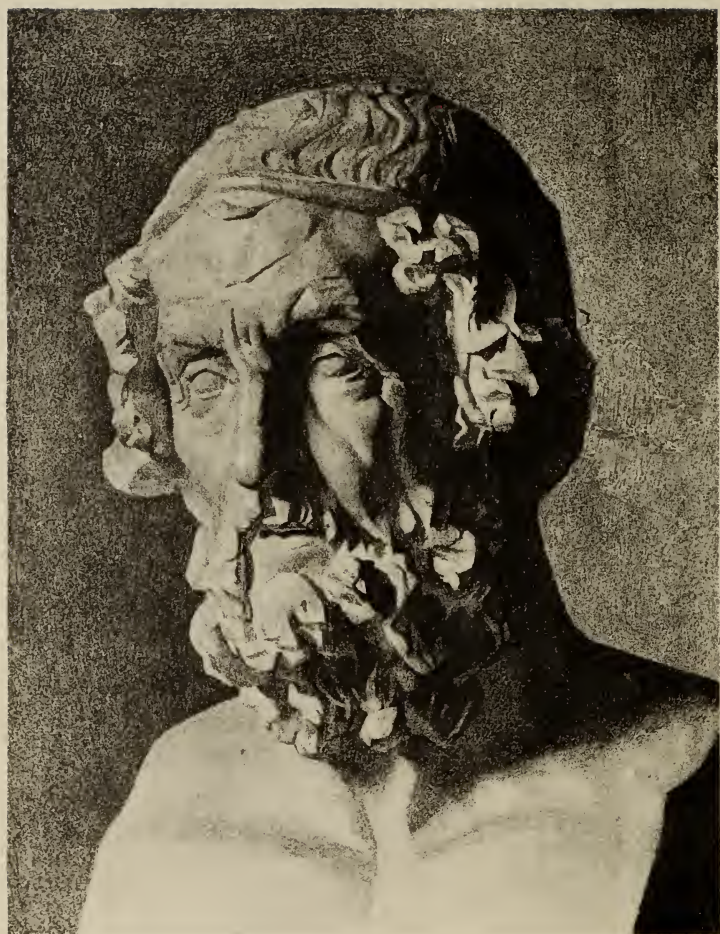
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THE ANTEFIX PAPERS.

PAPERS

ON

ART EDUCATIONAL SUBJECTS,

READ AT THE WEEKLY MEETINGS OF THE

MASSACHUSETTS ART TEACHERS' ASSOCIATION,

BY MEMBERS AND OTHERS CONNECTED WITH THE

MASSACHUSETTS NORMAL ART SCHOOL.

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P R E F A C E .

THE papers here collected were written by many earnest workers in a cause which is becoming every day more important in the eyes of Americans. Knowing my deep interest in that cause, the members of the Massachusetts Art Teachers' Association have charged me with the task of writing a short Preface to their volume, which I have accepted, though quite aware of its special difficulties.

To write a preface for a book of one's own, or for a book written by one author, either of which is likely to be uniform in thought and style, would have been far easier. Seven cities claimed to have given birth to Homer, though the right belonged to one only; but here are twenty authors who claim to have produced one book, and each with reason. Add to this all the authors whom they have separately consulted, as being therefore rightful claimants to a share of authorship, and the amount becomes difficult to calculate. We know of one marble group made by three Rhodian sculptors in ancient times, and we read of one statue constructed after the Egyptian canon at a still earlier time, by two Greek sculptors, *dimidium dimidiumque*, and this so perfectly, that when the two halves were brought together, they fitted exactly. So also we have modern landscapes painted by two artists, this one having put in the trees, skies, and water, and the other the figures; and we have books, such as the novels of Erckmann and Chatrian, and histories of art such as that of Crowe and Cavalcaselle. But these are very simple examples of the division of labor compared to this furnished by the Antefix Papers, whose authors and ante-authors, like the loves of Don Giovanni, number "cento e tre."

Taking into account that authors are proverbially sensitive, it is important to decide how to speak for them collectively to the public, so as to content them all. I look in vain for a guiding precedent. Dr. Daniel Dove, who catalogues and defines all sorts of prefaces possible to be written, had evidently never heard of such a case. He defines the abject preface, in which the author appears with a halter round his neck, deprecating criticism, — a style of procedure not suited to my purpose; for how can I be sure that my clients are all disposed to be represented in so humble an attitude? The doctor furthermore explains the blustering preface, in which the author

endeavors to terrify the critics into silence by putting a bold face on the matter, and threatening to make an end of them if they refuse their approval. This sort of preface seems hardly more appropriate, considering that many of the authors of this book, and perhaps all, are gentle people, who have labored to the best of their ability, and only ask their readers to judge the result kindly.

The best preface to the volume will perhaps be the simple statement, that it has been printed, not published, for the use of its authors, and of students like themselves who needed information in a compact form, on a variety of technical processes. It is a student's book, intended to be useful rather than ornamental. But I hear a wide-awake critic say, "If this be so, its title is a misnomer." An antefix is an ornamental tile of marble or terra-cotta, placed on the top of a cornice or under the eaves of a temple, at the end of a ridge of tiling. Quite right I answer, but the lions' heads carved on the upper mouldings of a cornice, to serve as spouts to carry off water, were also called "antefixæ." They served a useful purpose like these papers, which occupy a modest place outside the Temple of Art, and carry off the waters of accumulated study to fertilize waste places.

And now, a word about the why and how they were written. Their subjects were entered by the supervisor of the Normal Art Training School, upon the examination list for the end of the second year. The information needed by each student, being scattered in the pages of many books, could only be obtained by a great amount of reading. Time was wanting for each one to study up all the subjects, so that it was wisely decided to divide the labor by allotting one subject to one person, who, having accomplished his task, should read a paper upon it before the Massachusetts Art Teachers' Association for the common benefit. The wish was then expressed that all the papers should be collected and printed, so that they might serve a future as well as a present use.

Now that the reader has learnt how this book came into being, he will doubtless be inclined to regard it with interest. It is, indeed, entitled to consideration, not only because it contains a great deal of valuable and well-condensed information, but also because it is the work of men and women meanwhile laboring, under every disadvantage, to fit themselves to be art teachers. When we think of the palatial halls in the Normal Schools at Vienna, or of the admirably adapted rooms in which art students work in many European and English cities, with proper ventilation, good light, and plenty of space, — three primal necessities, without which the best powers cannot be called into play, and know that even these are denied to the students at Pemberton Square ; when we remember how their fellows abroad have not only such physical and material advantages, but that they are also surrounded with an abundant supply of the best casts, solid models, drawings, photographs, and reproductions of all kinds, and that they live where they may at any moment profit by the splendid works of art collected in such industrial museums as those at South Kensington, Vienna, Nuremberg, or Munich, and

in such galleries as the Louvre, the National Gallery, the British Museum, the Uffizi, or the Pitti Palace, we wonder, not only that our Boston students have accomplished so much, but that they have accomplished anything at all. So far from apologizing for what they have not done, we are filled with admiration for what they have done, and wish them God-speed. They have proved once more the truth of that most encouraging of all Latin sayings, "*Nihil est quod non expugnet pertinax opera et intenta ac diligens cura*," — a saying which all know in its well-worn English rendering, "Patience and perseverance conquer all things."

C. C. P.

BOSTON, June 30, 1875.



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SOME OF THE AUTHORITIES

CONSULTED IN THE PREPARATION OF THESE PAPERS.

- The Grammar of Ornament. By OWEN JONES.
Polychromatic Ornament. By RACINET.
Epochs of Painting and Analysis of Ornament. By WORNUM.
Vasari's Lives.
Kügler's Geschichte der Kunst.
Field's Chromotography (old and new edition).
Ure's Dictionary of Arts and Manufactures.
Masury's Manual of Painting.
Dresser's Principles of Decorative Design.
Principles of Design. By GARBETT.
Art Education. By WALTER SMITH.
The Works of Ruskin.
Chevreul on Color.
Chambers's Encyclopædia.
Scott's History and Practice of the Fine and Ornamental Arts.
Wonders of Engraving. By GEORGE DUPLESSIS.
The World of Science, Art, and Industry, 1853.
The History of Lace. By Mrs. BURY PALLISER.
Chefs d' Œuvre of Industrial Arts. By PHILIPPE BURTY.
Fine Art: a Sketch of Its History, etc. By M. DIGBY WYATT.
Dictionary of Greek and Roman Antiquities.
Iconographic Encyclopædia of Science and Art. By J. G. HECK.
The Report on Fresco Painting to the Commissioners of Fine Arts. By CHAS. H. WILSON.
Mrs. Merrifield's Art of Fresco Painting.
D'Anvers's Elementary History of Art.
Timbs's Painting and Progress of Art.
Goodwin's Mural Decoration.
A Treatise on Painting. By CENNINO CENNINI. Translated by Mrs. Merrifield.
Scott's Half Hour Lectures on Art.
Redgrave on Color, etc.
Hints on Household Taste. By CHAS. L. EASTLAKE.
Metal Work. By M. DIGBY WYATT.

I.

THE GREATNESS OF GREAT MEN.

THE position which I occupy in this school prevents my giving individual instruction in it ; that is the duty of the professors and regular instructors, and my duty lies in directing their work and judging of its results by examining the works of the students. It is recognized that the teacher cannot also be the judge, and as I am employed here to be the latter, I cannot be also the former.

My lectures to you, therefore, are on general topics, not on details of your education, rather on principles which will affect all the question. I have been accustomed to lecture in this way to the students of the Normal Art School, of which I was the principal before coming to reside in this country. One lecture given to them was on "the greatness of great men," and that is what I propose to give to you to-day.

I shall not apologize to you because all its incidents are English, for you belong to the same race as the men talked about. Though I am not an American, I don't consider myself a foreigner here. We are all Anglo-Saxons, under whatever sun or form of government. In England, an American or Australian is never described as a foreigner, though born thousands of miles away ; yet a Frenchman or Belgian, who lives thirty miles off across the channel, is always a foreigner. The Australian government is as different from the English as is the American, but the people are of one race ; and an Englishman in London who spoke of an Australian as a foreigner, would inevitably be reproved, and deservedly.

This statement now made, is not made for the purpose of bidding for popularity, or to impress you with the belief that I wish to assume a relationship to you I am not entitled to. When American ideas are strong enough to turn me into an American, they can do it, but meanwhile I shall neither help nor hinder the transformation. You must therefore regard this lecture as having been made to inspire with some right ideas the art students of whose education I had the charge before the invitation was given me to come here. Four years of residence here have not changed my opinions, nor altered historical facts ; and I therefore submit to you the lecture I am about to give, as being as applicable to you as it was to your representatives across the water.

The subject I have chosen to lecture upon to you to-night is one that is

difficult to talk sensibly about for the space of an hour and a half, and I hope if what I have to say should prove too lamentably the truth of this statement, you will extend to me your kindly indulgence, and regard my efforts only as a dry preface to a delightful study, a sort of rude finger-post, pointing the way where there are pleasant paths and mental pastures ever fragrant and fresh.

That which has engaged the most loving literary efforts of many great writers and thinkers, who even in the pithiest and tersest manner have written volumes upon the subject, either as discourses on Representative Men, or lectures on heroes and hero-worship, cannot be more than lightly touched upon by me in a lecture of ninety minutes ; but if I can awaken in you an interest which prompts you to become more intimately acquainted with the true greatness of great men, neither your time nor mine will have been wholly wasted.

It is said that a man may be known by the company he keeps ; and if there is any truth in this statement, it will be well for us to keep the very best company, not only physically, but mentally and spiritually also, not necessarily for the purposes of imitation, for no man can imitate another if he has much character of his own, but rather that there may be for us high standards of excellence supporting that which may be good in us, to counteract evil examples with which we are continually surrounded, and which are calculated to develop the faults and weaknesses of our nature, the earthiness that we all have.

For these reasons I have thought that you might not object to consider with me the characteristics of some noble and great men of past ages, or even of the present age, for the race is happily not yet extinct, convinced that even if I tell you nothing that is new, I may be able at least to tell you something that is true.

At the outset arises the question, What is greatness ? which reminds us of the Philosopher's introduction to an essay on Truth.

“‘What *is* Truth,’ said jesting Pilate, and waited not for an answer,”—and the probability is that had Pilate stopped to discuss the question with his would-be teacher, they would have hopelessly differed on the subject under discussion beginning at the definition of Truth. And Truth itself does seem to be to us merely the measure of our knowledge and not a fixed quantity ; for in the time of Joshua people believed that the sun did not stand still, a belief which has for some years been ridiculed through the discovery of later Philosophers that the sun is a stationary body ; and now that many strong-minded persons have scoffed at the Holy Scriptures because of Joshua's command to the sun to stand still, the last generation of Philosophers have in a more recent age discovered that the sun is not stationary, but moves in its own orbit, as it did in the time of Joshua.

There may be an equal difference of opinion as to what is and what is not greatness amongst ourselves, just as doctors and philosophers disagree ; and it is certain that successive generations of men hold very different opinions concerning the men who have preceded them. We should not in this age

hang the dead body of Cromwell upon the tree at Tyburn, nor burn the bones of Wycliffe forty years after they were buried. But the men who did these things were lovers of truth and greatness, though terribly in earnest, and believed that they were meting out righteous retribution to the carrion they destroyed; whilst some of us now should regard their hanging and burning as the acts of savage fanatics towards two great men, who were in advance of the age which so treated them.

Perhaps on the debatable ground of politics and religion men differ about their leaders through their feelings and passions; if they disagreed only through their reason or knowledge, they might differ without quarrelling and be willing to recognize greatness, even when the stamp of it was not of their own trade-mark.

I will ask you to consider the different ways in which greatness manifests itself to us. — It may be,

1st. The possession of ordinary human faculties or accomplishments in an extraordinary degree of development; or —

2d. The possession of uncommon faculties or accomplishments; or —

3d. The possession of an unusual combination of characteristics, admirable in themselves.

And it may be asserted broadly that the final test by which greatness is to be judged, is that it has been exercised for the instruction, wholesome pleasure, or happiness and benefit of mankind; if it does not stand that test it descends from the rank of true greatness and becomes merely local importance, temporary popularity, fashionable homage of the day or the hour, party prominence or sectarian distinction, all of which are as the grass which withereth and the flower that fadeth.

No age is competent to decide on the greatness of living men, — Time alone which tests their work can do that, — for time, like another ordeal of which we are sometimes reminded by our pastors and masters, tries the work of all men, as it were, by fire, out of which some of it comes a mere handful of blackashes which the winds of heaven scatter in undistinguishable atoms, so that the place thereof shall know them no more; whilst the work of great men will be like the vases of the Etruscan potter, — the redder the fire glows, the harder becomes the metal and the brighter the colors; and the more the furnace is heated, the more permanently is the work preserved to a distant posterity of admirers.

Thus you will see that I regard the element of greatness in great men as a different thing altogether to the greatness of great sinners, or the largeness of big bodies; which are either intensity of habit, or magnitude in the aggregation of atoms.

It is not of necessity importance or distinction, for many important and distinguished men will never be considered great. George the Fourth was a distinguished and Lord Palmerston was an important personage, and neither will ever be considered great.

Nor is it often allied to perfection of life or manners, for the greatest men have been fallible, very human in their weaknesses, and sometimes very simple.

Neither does popularity, however intense, give us sign or proof of greatness; least of all will the most exalted dignity of official position, or the profoundest depths of learning, give a man right of themselves to the title of a great man.

The importance to us of great men is that they fix a standard of excellence, show us what is possible. That which common men attempt, great men attain; therefore it behooves us to study their characters, that we may, if possible, learn the secret of their success. What is this secret?

The secret of great men is that there is no secret at all, and this is a secret which, though proclaimed upon the house-tops before multitudes of hearers, will then always be believed to be a secret, and for no better reason than that it is the easiest and most plausible way of explaining the difference that we see to exist between ourselves and those we acknowledge to be great. If we would fairly and honestly take to the acknowledgment also, that whilst we have slept great men have worked, whilst we have been self-indulgent and prone to luxury, they have been self-denying and inured to hardships, we should lose something in the good opinion we have of ourselves, but we should gain a great deal in self-knowledge, and dispel a mystery which should be no mystery at all.

There seems to be common elements of character in all great men, almost the identical basis of character in one as in the other, the different vocations explaining any minor differences that are to be found in them.

Thus, I find precisely the same features in the characters of Michael Angelo and the Duke of Wellington, two men living three centuries apart, in different countries, one a great artist and the other a great warrior. In them, as in every instance I have yet studied, the distinguishing feature is an intense *love of work*, — work of the kind that fell to the lot of each to do. Another feature is *indomitable courage*, and the last is a *never-dying perseverance*.

Though I have carefully studied the histories of many of the greatest men, in order, if I could, to discover the source of their greatness, I have never yet come upon one great life that has lacked these three features, — love of work, unflinching courage, perseverance.

And this leads me to express the opinion that the only reliable sign or indication of genius is eagerness for and love of work, as a basis; and whether this genius will ever become developed to maturity will depend greatly upon the other two features, — courage and perseverance, — though, of course, something depends upon health.

It is undoubted that both in literature and art the greatest have been the most prolific, that is, have been the greatest workers before they became the greatest men; and had they not been the greatest workers the world would never have known them as the greatest men.

I was struck with the happy way in which this truth was put, in a quotation from an article by Andrew Halliday, which I will reproduce, as bearing upon the question.

“There is no royal road to literary success. Don’t imagine because some

writer suddenly attains to fame that he has achieved it by a single *coup*. Make inquiries, and you will find in every case — there is scarcely an exception to this rule — that the author who suddenly bursts upon your view a star of the first magnitude has been working and learning and struggling — mayhap starving — for years, qualifying himself by practice, sometimes in the very humblest walks of literature. Mr. Dickens was famous at three-and-twenty, but for many years before his celebrated sketches were accepted by the ‘Morning Chronicle,’ he had been qualifying himself for authorship by constant practice as a reporter on newspapers. While yet a boy he had led a life of close application and drudgery. He had mastered the difficult art of shorthand writing. Before he became a great author he was one of the most accomplished shorthand writers on the press. Mr. Thackeray had reached middle age before he made himself known to the public. He had tried and tried again, first with his pencil, then with his pen, and had felt the smart of many failures. After he became famous as a novelist he tried his hand at a play, which, though indorsed with the great name of Thackeray, no manager would accept — because it was notactable. John Philip ground colors and painted signboards before his pictures reached the line in the Royal Academy.”

Another feature which seems equally common to great men of all ranks and professions, is that failure does not discourage them. There is a certain amount of failure to be gone through in everything before success becomes a matter of certainty. Unless we exhaust the sources of failure a supply will always be ready to our hand, and if we set down with tearful eyes and lamentations surrounded by our mistakes and overwhelmed by them, we shall never rise above them, so that courage and perseverance are also necessary to greatness, — whilst failures and mistakes are just as much characteristic of greatness in the first stages, as of littleness, — only greatness perseveres and overcomes, whilst littleness loses heart and fails.

When George Stephenson undertook to make a railway across Chat Moss, a swampy bog which swallowed everything that was put upon it, most of the engineers of the day said it never could be done. Stephenson, who undertook to do it, showed by his undertaking the work that he had decided it could be done. He commenced by throwing in thousands of tons of dry rubbish, which seemed to sink down and settle apparently out of sight, without in the least degree affecting the solidity of the mass. It seemed like throwing a handful of sand in a bucketful of water; and whilst overlookers and foremen and directors of the railway watched in despair, other engineers chuckled with delight that at last the Newcastle pitman had been beaten. He was urged to abandon the project as impossible; but great men don’t do that sort of thing, and Stephenson was a great man. He went on with the result inevitable to perseverance and knowledge; the swamp was made into a good road, and was afterwards considered the strongest and safest part of the line.

Here was a case where the wheeling of a few extra barrowfuls of earth made the difference between success and failure; only it took the heart of a

great man to do it, — the difference between greatness and littleness, — for a less man than Stephenson would have abandoned the project, as everybody except himself was willing and anxious to do, but he was made of a different material to them, and that material triumphed over Chat Moss.

In what does the greatness of Turner show itself, the greatest by far of English artists? Broadly we may say that his superiority is seen in two things: his marvellous powers of execution, which showed his success as a workman; and, secondly, his power of imagination.

Now, how is his superiority in the process of painting explained? I think if it be remembered that no English artist ever covered so much surface of canvas and paper as he did, or left behind him so many studies of effects or sketches of pictures, it seems to me we need go no further to inquire why he was a perfect workman. The explanation is that he was always at work.

Then as to his imagination. Imagination is simply the power of realizing in the mind something which does not or has not existed, based upon a knowledge of that which either has existed, does, or may exist. Imagination has the same relation to knowledge as the flower has to the seed.

Now, if a man's knowledge, as shown in his multitude of works, be almost perfect, his imagination, based on his knowledge, comes to be great also; and thus we have Turner's second characteristic springing out of his first imagination from knowledge, and knowledge from labor. The labor came first. As a youth Turner would do anything pictorially for anybody who would pay him for his work. An architect wished a sky washed in a perspective drawing, and sent it to a lad named Turner, who would do it for five shillings. A stationer had an order to tint a map, and the barber's son was ready and willing to color it for eighteenpence, with sixpence extra for colors. Then when the sky-painting business increased, and skies in his hands became more celestial, prices rose, and Turner's heavens became costly. A neighbor who came to father Turner's shop to be shaved, would ask whether Joe could not clean and brighten up a little picture which had got out of order. The barber could not tell, but would call his son down, and the laborious youth would be called from his attic den to examine the picture or drawing. Oh, yes, young Turner could do it, or anything he could learn something from and make a shilling by.

Then came drawing for the illustrated books, which was a mine of wealth to him. Then pictures and colored drawings began to be produced, not in twos or threes, but in scores and hundreds, whether there were purchasers or not, some bad, some indifferent, and some good. Still and forever working and progressing, he ended a career, begun in obscurity, terminated in world-wide celebrity, starting in comparative poverty, finishing by leaving nearly a quarter of a million of money sterling to his nation or his fellow-craftsmen, and a reputation that will live as long as civilization lasts and pictures remain.

I take this instance of an artist, having the greatest technical skill and the sublimest of imaginations, to show the young people here how a genius is made. The usual theory is that if he be an artist he is born with a palette on his thumb, at once producing pictures which astonish the world, and that he is a

very lucky individual for whom nature does so much. Nature, as a matter of fact, did very little indeed for Turner ; gave him a very insignificant body, no position in life to start with, no great or brilliant prospects in the succession to a hair-cutting business ; but it did give him what it has given to most of us, the opportunity to work as hard as we like, and he seized the opportunity. The five-shilling skies and the two-shilling maps were all opportunities, and he took them, and, doing them honestly, — most likely a good deal better than he was paid for, — they bore him on to triumph.

Now, what nature did for Turner (and in very many cases much more) nature has done for us, and it rests with ourselves whether our work, honestly done, shall end as his work ended, or whether it shall end insignificantly. The only difference is whether we will work eight hours a day or three. We settle that, not nature. I find that in one command is contained all the injunctions to those who would achieve a great life. It is this : "Whatsoever thy hand findeth to do, do it with all thy might."

It is not the nature of your work, nor the importance socially or pecuniarily of your trade or profession, that will give you the opportunity or means of living a great and noble life ; for there are noodles in every calling, however important, and nobles in every occupation, however insignificant. The man dignifies or degrades the office, the office does neither to the man.

There is absolutely no employment which may not be made the means of arriving at success in life ; there is none which cannot be degraded into failure. The only stipulation is that your hands shall have found the work to do and that it shall be done with your might, — not with your inclinations only, nor with faltering hands and timid hearts, but with might, and might means strength of hand and strength of heart, skill and courage combined in one strong word.

It is, perhaps, one of the most notable features of greatness that it is almost invariably accompanied by modesty. Great knowledge introduces us not only to the secrets of learning, but to the depths of our ignorance, and the man who has discovered the profundity of his ignorance must have advanced very far into the region of knowledge.

It was Sir Isaac Newton, one of the greatest of Englishmen, who was congratulated at the close of a life of brilliant discoveries on his great achievements, and his answer is the answer of a man who by going further than other men had discovered the depths of his own ignorance. "Sir," he replied in answer to the compliment, "I feel that I have been like a little child playing with the pebbles on the margin of the ocean, whilst the great voyage of discovery is yet to be made."

Michael Angelo, who was sculptor, painter, architect, engineer, and poet, and take him for all in all the greatest artist the world has ever produced, was discovered when he was more than eighty years of age studying a fragment of ancient sculpture in a ruined building at Rome. He was reverently asked by a friend who observed him, what was the nature of his inquiries ? "Signor," he answered, "I am studying my profession." This was the modest reply of a man who as a sculptor, as a draughtsman, or as an architect

had not been equalled in his own time, and who though three centuries have rolled on since his death, has not yet been equalled even up to this day.

And this leads me to say, that no matter what our pursuit may be, at the moment we arrive at satisfaction with ourselves, we die. If the doing of anything has not so improved us that we could do it infinitely better if we did it again, and feel both the power and the desire, life itself, the principle of development and progress, is dead within us; and those who have been improved must necessarily feel dissatisfied with their own works, and this dissatisfaction induces modesty. It is only complete little nobodies who fancy their work complete, who believe they have nothing to learn and cannot be wrong. Such people do not fancy themselves children on the seashore playing with pebbles, nor do they study their professions after they have passed the eightieth year of their age, although they have neither discovered the theory of gravitation nor built the cathedral of Saint Peter.

No better illustration of the perseverance of great men can be given than that of Sir Isaac Newton when his MSS. were destroyed. By some mischance his favorite dog Beauty was shut in Sir Isaac's study. The papers and MSS. containing his calculations and discoveries in science yet unpublished, the laborious and priceless work of three years of severest application, were arranged on the table, near to the student's lamp, whose midnight oil shed a glimmering light on the precious documents. In his efforts to escape, Beauty overturned the lamp and the papers catching fire were all reduced to ashes. Sir Isaac found his three years' work had disappeared, leaving no fragment behind of the abstruse calculations and hard-earned triumphs. Did he give way to despair and abandon his inquiries? No. He made but one reproachful speech, "Oh, Beauty, Beauty, thou knowest not what thou hast done," and then sat down to commence over again from the far distant beginning, the years of work that an accident had destroyed.

That was true greatness, having every feature of it, — work, courage, and perseverance.

My idéal of greatness among soldiers is drawn from the Duke of Wellington, one of a very small number of men whom the profession of killing has left respectable.

If a man under extreme necessity has extremely dirty work to do, such as the slaughtering of conscript Frenchmen, or annihilating one of the Hill tribes of India, it is some credit if he does it without feelings of passion or revenge, and comes out of it as little demoralized as is possible, with as few of the Ten Commandments broken besides the sixth, as was practicable.

The conduct of the Duke in the Peninsular War proves him truly a great man. It is stated that during those troubled times the English army was so well managed when in France that the French peasants, in fear of the rapine and license prevailing among their own military countrymen, would carry their property for protection within the English lines. And though when in Spain the English soldiers were regarded as the saviours of the country, and might in return for the hardships and fighting undertaken, expect to be allowed to make themselves somewhat at home, yet there were actually fewer

offences of a civil character among the victorious English soldiers than there would have been had they been at home in barracks. All this was due to the Duke's personal influence, his greatness, for true greatness may be shown in little things. Then again, when occupying Paris as a conqueror, together with Blücher, the Prussian General wanted to blow up a few of the bridges, and in other ways write the lesson of humiliation upon the French capital in rather large letters, — capital letters, we might say, — Wellington would not allow a single act of revenge. But he took the opportunity of having the pictures, statuary, and other works of art, which Napoleon had pillaged from the various capitals of Europe, returned to their rightful owners.

So scrupulous was the grand old English warrior about his conduct, that at one time during the great war in Spain, when he had been most disgracefully left without pecuniary supplies by the squabbling ministry at home, he got behind in payments for his commissariat — the food and shelter of his men. This distressed him exceedingly, and his appeals for money from England were constant. In one of them he said that he was almost afraid to go out of camp for fear of being dunned. Imagine the commander-in-chief of the army that was saving Spain being dunned by Spanish butchers, grocers, and bakers !

Such conduct as this goes far to make even war respectable. But observe it was not his office that made Wellington great, it was his principle. He was sent to stop a great French thief in his career of robbery, and he accepted the business. It was not to be expected of him, then, that he would allow his own countrymen to turn thieves on a small scale in a foreign country ; and when he himself found he had been feeding his men and could not pay for their food, he suffered the pangs of conscience. Luckily the supplies from home came, and the credit of the English army rose, and with it the spirits of its commander-in-chief.

If this alone were told to me of one man, and the pillaging of picture-galleries of another, I should at once say, "The greatest of those two men is the man who pays his way and does n't steal." It is possible that Napoleon may have won more battles than Wellington, it is certain that he lost more ; it is possible that Napoleon killed more men than Wellington, but did he save more lives ? Wellington fighting against Napoleon, and conquering him, was saving the lives of thousands of Frenchmen who would have been duly sacrificed by their Emperor to the lust of war.

But of Wellington how different is the tale ! After a battle was won the most dreadful thing to him was to hear read a list of the killed and wounded among his own men ; and several instances are recorded of this man, who was called "the Iron Duke," when the cost in human life of a battle was made known to him, crying passionately at the dreadful sacrifice. Yet if ever a war was defensible, that war which was engaged in to stop the career of an European thief was righteous. Nevertheless some people still say Napoleon was a great man. Do you suppose that a man who stole pictures, the precious heirlooms of a country's greatness, as Napoleon did, ever was scrupulous about stealing meat and drink and bread, or about stealing human life ? A

thief takes that which comes in his way, that which he wants, and neither the independence of a nation, nor the property of cities, nor the lives of its inhabitants, are beneath the pilfering wants of a very big thief. Napoleon took all.

This is what I meant at the beginning of my lecture by saying that greatness, in my opinion, did not mean the same thing as the greatness of great sinners. That is an altogether spurious greatness, which bears the same relation to the real thing as shoddy does to broadcloth. It may have a grand appearance, but it has no staple ; it may look well, but it does not wear well. There is more cloth than dinner, as Yorkshiremen wisely say ; and what dinner there is does not agree with us, but leaves a bad taste in our mouths, a doctor's bill to pay, and penitence as a reward.

I have before remarked that the mere acquisition of great skill and its possession, does not of itself make men great ; it only furnishes them with the means to achieve greatness, and proves their undoubted capacity. The final test is the use to which either their knowledge or skill is applied. Thus, the most accomplished surgeon may be the instrument of life or death ; a great writer may elevate the tastes of a nation, whilst an equally able writer may deprave its tastes, and this use of his skill excludes him from the ranks of greatness ; a great warrior may, by his very victories, save human life, as Wellington did, whilst a warrior of more genius, as it is sometimes said, like Napoleon, is simply a cut-throat in an extensive way of business.

That which constitutes the difference in these cases is the uses and purposes to which great accomplishments are applied. I regard the accumulation of money by any individual, through his own exertions or skill, if he has done it with clean hands, as a sign of great powers ; but the use he makes of his money is the sole test of his human character worth having. If he simply possesses vast resources, he is rich only ; if he considers himself as the steward of those riches, for the advancement of happiness and righteousness, he is wealthy also, for he is one who has regard for the common weal, and who fosters it. In the most exalted of all vocations, that of statesmanship, a man with the ripest experience and most brilliant powers may either consider or originate measures for the advancement of a nation, rising above all trammels of party, interests of clique or class, or benefit of the few ; or he may survey all his privileges and opportunities as means for furthering his own position or that of his friends, of lowering his political opponents, and triumphing in the possession of power.

It is not difficult to see on which side lies true greatness in that case.

And this brings me to consider the different kinds of greatness in subdivisions. It may be moral, intellectual, or professional, though from what I have before said, you will gather that I regard intellectual or professional greatness more in the light of trade skill, unless accompanied by the element of moral worth. It is only when all three are combined that we have the highest order of men.

First, of moral greatness.

In this dilapidated old world, there have been, and still are, I hope, many

instances of moral greatness among men, though I do believe it is to be found much more frequently among women than men.

We live in an age of change ; it is the fashion, and alterations are sometimes mistaken for novelty. The nineteenth century is one of scientific discovery and artistic revival, and pre-eminently a fast age. The one great invention of locomotion by steam has increased the speed of everything except thought, and not only the speed but the haste. Even in the earlier and later periods of my own life-time, I see a marked difference in the way in which all kinds of work are carried on, whether manual or intellectual. The iron horse has outraced the animal of flesh and blood, and we are rapidly learning its paces ; the iron has indeed entered into our very souls, — whether for good or evil time alone will show. The good of it is perhaps the vanquishing of time and distance, and in other ways the general overcoming of material difficulties. The evil of it is, that though we do twice as much work as formerly in the same time, we think no more, but perhaps less ; we have no time to think, but go crashing on to save ourselves from being crushed in the hurry of progress.

This seems to me to account very much for the moral littleness of our age in many important features. Competition is an excellent thing when confined to the trial of which shall do the best. It is an awful thing when it resolves itself into a bid as to which shall do the worst under the appearance of the best. And yet it seems to me this is what we have practically come to, in various and multitudinous ways. If I were asked to define the precise characteristic in which the nineteenth century is distinguished above all others, I should say, not in haste, but with great deliberation, “the art of deception.” I do not think there ever was a time of which it could be more truly said that “deceit and guile go not out of our streets.” It was reserved for the nineteenth century to invent shoddy and discover chiccory, — and great authorities say that with the exception of green-grocery and butchers’ meat there is no single article of food that is not adulterated. The butter-men say they don’t adulterate their eggs, owing to a difficulty in the penetration of the shell without visible external injury. But then the British public notice that fresh eggs are sold at an advanced age, in a forward state of decomposition, and that this is an ample equivalent for adulteration.

We became accustomed to the mixture of chiccory with our coffee when it was legalized, and grocers had proved that the coffee was better for the chiccory ; but when the “Lancet” informs us that chiccory itself is extensively adulterated with a still cheaper and viler compound than itself, I own to being struck with astonishment, if not with admiration, at the inventive power of the age we live in.

The only question is, can this universal deception go on, and leave a fragment of moral rectitude behind it ? for the disease is not confined to food nor raiment. Another form of it attacks almost every relationship of men towards each other, and all are subjected to its influence. I do not say that all are participators in this general evil, equally or actually. There are as many honest men and women now as ever there were, and moral greatness is

as possible to-day, in the nineteenth century, as in the days of all the centuries preceding it. Yet I do think we pay very heavily, both in our morals and our purses, for the Moloch of cheapness and competition we have fallen down and worshipped, and we have not seen the end of it yet.

These remarks may seem a lengthy preface to what I shall have to say on moral greatness, but are necessary to explain my own definition of the quality ; because, also, it is of such infinite importance to all and each of us that, whatever our intellectual or professional attainments may become, our standard of moral greatness shall be of the very highest. And it is also a question which affects the lives of every human being, every day of the week and every hour of the day, of the highest and lowest, the richest and poorest, youngest and oldest, the most learned and most ignorant, the most foolish and the wisest. Whatever else we may attain to, we have the means and opportunities already in our possession of attaining moral greatness, and the opportunity comes to every one of us every day of our lives.

In the first place, it is necessary to understand what the quality is before we can understand it in others or practise it ourselves. After considering the lives of many persons whose moral greatness has been unquestionable, the basis of it appears to me to be that a man shall have thought most carefully for himself, with all the help he can get to assist him from every source, and finally settled in his own mind what is the right moral principle to act upon under all circumstances, and, having so settled, to make a sacred compact with his own conscience that, by the blessing and help of God, he will never depart from it, let the temptation come in whatever shape it may ; to regard departure from this standard of duty as the greatest of all calamities, and himself as the most scrupulous and exacting of all task-masters.

Such is the basis of moral greatness, and it will be seen that taken as a rule of life, or a condition to be acquired, it is of untold importance, and it explains also the principle upon which the morally great have attained their greatness ; not without sacrifice, for such a spirit as I have described entails constant sacrifices ; and when a man has appointed his conscience to be master over himself, with full authority and promised submission, master and man are never far apart, the eye of the master is always over the workman.

The whole noble army of martyrs, whether for the spread of Christianity, the uprooting of mental thralldom, or the reformation of national injustice or vices, may be instanced as examples of the morally great. Their distinguished positions, the depth of their sufferings, the magnitude of their labors, the bitterness of their trials, and the greatness of the benefits achieved by their sacrifices for us, all impress upon our memories the lessons to be learned from them, and upon our hearts the gratitude which is their just due.

In our own country a just and creditable acknowledgment to moral greatness has recently been made in the erection of a statue to Andrew Marvell, in the town hall, Hull, of which town he was both a native and representative in Parliament. His character seems to have been moulded upon the one great principle of moral integrity, from which no penalty could make him

swerve, no bait tempt him to depart. In a few words the following sketch illustrates his character and tells us who and what he was, besides giving us a typical instance of his temptations and victories : —

“ The borough of Hull, in the reign of Charles II, chose Andrew Marvell, a young gentleman of little or no fortune, and maintained him in London for the service of the public. His understanding, integrity, and spirit were dreadful to the then infamous administration. Persuaded that he would be theirs for properly asking, they sent his old school-fellow, the Lord Treasurer Danby, to renew acquaintance with him in his garret. At parting, the Lord Treasurer, out of pure affection, slipped into his hand an order on the treasury for £1,000, and then went to his chariot. Marvell, looking at the paper, called after his lordship, “ My lord, I request another moment.” They went up again to the garret, and Jack the servant boy was called. “ Jack, child,” said Marvell, “ what had I for dinner yesterday ? ” — “ Don’t you remember, sir,” said Jack, “ you had the little shoulder of mutton that you ordered me to bring from the woman in the market ? ” — “ Very right, child ; what have I for dinner to-day ? ” — “ Don’t you know, sir, that you bid me lay by the blade-bone to broil ? ” — “ ’T is so ; very right ; child, go away.” Turning to Lord Danby, he said, “ My lord, do you hear that ? Andrew Marvell’s dinner is provided ; there’s your piece of paper, I want it not ; I know the sort of kindness you intended ; I live here to serve my constituents ; the ministry may seek men for their purpose, I am not one.”

Nor were the pains of hunger or the discomfort of a garret the only sacrifice entailed upon him for his incorruptible morality. It is believed that after suffering from the danger and menaces of a corrupt court and a venal administration for a long time, during which his very life was constantly threatened, he died most suddenly and unaccountably, and not without strong suspicion of foul play, from those whose vices were the natural enemies of his many virtues.

I hardly think the anecdote I have just related does him full justice. If there had been no blade-bone to broil, the bribe would have been as promptly refused ; for having settled definitely what was to be his conduct in life, blade-bones and treasury bonds would be equally powerless to move him.

That kind of moral greatness leads men to reject the wrong, and I will now tell you of another phase of the same character which is seen in self-denial.

Sydney Smith, as Prebend of St. Paul’s, when the living of Edmonton fell vacant by the death of the incumbent, was entitled by rotation to become the new vicar, or give the vicarage to some one else. The late vicar left behind him a widow, daughters, and a son, who was his curate. The widow had a certain time given her to remove from the vicarage, and as she was left in very straitened circumstances by the death of her husband, she was in a very melancholy condition at her affliction and prospects. When the Rev. Prebendary Sydney Smith called upon her, it was, she supposed, to make inquiries concerning her leaving the home she had lived in so long and happily, and she met the reverend gentleman with a doleful countenance, and with what courage she could summon referred to himself as the new incum-

bent. Sydney Smith, who had been a witness of the grief of mother and daughters, and had before convinced himself by inquiries of their circumstances, at once disclaimed the notion that he was to be the new vicar, but added that he certainly had called for the purpose of introducing that gentleman to them, which he now would be happy to do. Leaving the room, and the ladies in some degree of astonishment, he fetched out of the late vicar's study a gentleman who had been waiting there by his express wish. Advancing hand in hand to the ladies, the prebend said, "Allow me to introduce to your kind notice the new vicar of Edmonton." Well! the new vicar was the widow's own son, who had been curate to his father, and thus home was to be home still, and the widow and her daughters were neither houseless nor in poverty.

Now, it would have been pleasant enough, no doubt, for Sydney Smith to have taken that living for himself, and under some circumstances he would have done so; but when he came to know what the real circumstances were, his mind was made up in a moment. He must give way himself, and he did it right nobly.

These are illustrations of moral greatness, to which might be added the whole roll of noble acts which add lustre to the names of such men as Augustine, Luther, George Fox, and others of our own day. I consider it as eminently moral that in the railway mania George Stephenson would never have lot nor part with speculative railway schemes, got up to be bought off. When his name might have been used to bolster up a rotten project, and thousands were offered for so using it, he never would consent so to sell his honor, although he himself would have always profited by others' loss. But he knew these schemes were wrong; they meant plunder, and he would have none of them.

I like, too, the story of that London brewer who became a convert to the temperance cause late in life. A rich man made rich, as he now thought, by the poverty and misery of thousands of his poorer brethren. What was he to do? Sell his business, and let somebody else go on poisoning the people and making drunkards of them? No; he could not do that. What was to become of the thousands of gallons of beer in his vats now? Why this is what he would do, and did. He would turn the whole lot of it into the Thames, so that it should do no harm to a living creature, for he knew that fish were sensible enough to prefer water to beer; and into the Thames it went. Without being a teetotaler myself, and believing that there was a waste of good malt and hops in the transaction, I yet distinguish in it a feature of true moral greatness. I know of a case in which a literary gentleman, of irreproachable life and morals, went into partnership with a man who turned out both rogue and fool. After a few years of partnership the business came to a crash, entirely through the mad folly of the senior partner, who was not my acquaintance. The case was a very bad one, and though the full rigor of the law could have been passed upon the bankrupts, the creditors sympathized with the gentleman, who was even a greater victim than themselves. His statement was very simple: "Gentlemen, we have all

been robbed, and I am now in your power. Here is my body. You can shut it up in prison and be revenged, if you think I have done wrong. If not, and you leave me free to work for you, I will do so: The first money I earn I will insure my life for the total amount of my debt to you, for your benefit, and, as soon as I can, I will pay you in full." The creditors knew this man's moral worth; they trusted him, and have long since been paid off in full, principal and interest. But it will be given to few to know his labors, his self-denial, and his trials during the few years he was performing this self-imposed task. No poor laboring man ever lived more abstemiously, worked half as hard, or underwent more self-abasement than he did for those years; but he triumphed in the end, and has gone on triumphantly ever since.

I shall not multiply instances; but will add that though called upon only seldom to perform great acts of self-sacrifice, for the sake of moral principles, hardly a day can pass which does not summon us to fight in some capacity, however humble, under this standard.

Of intellectual or professional greatness I shall not have so much to say; this much, however, I must say, that there is one fallacy held with regard to it which deserves to be exploded. It is a common saying that the shoemaker should stick to his last, and that a jack-of-all-trades is a master of none; that a man who studies many things is not so likely to succeed as he who confines himself to one, and many other such decoctions of wisdom. My knowledge of the characters of intellectually and professionally great men leads me to an opposite conclusion. I believe that the reason so many fail is, that they confine themselves too exclusively to the groove in which they are placed and along which they are taught to run. There is no subject connected with the happiness of human beings which does not by its study strengthen the mental faculties, improve the powers of perception, and make abler men in whatever their profession or trade. When study of a subject directly connected with the daily work of life can be undertaken, it must immediately affect the quality of work produced by the student, and influence it for good. But even when not immediately connected with that web which like industrious spiders we have to weave every day for our daily bread, a fair and honest investigation into a branch of knowledge that is new ground to us will be found of practical advantage.

The very greatest men in every department of knowledge have been distinguished in many other branches besides their own, and in my opinion owe their superiority mainly to it. In the architecture of St. Peter's there is the grandeur of composition that was learned by Michelangelo in his study of sculpture; in his cartoon of the last judgment the strong effects of light and shade and dramatic treatment he produced in designs for public monuments. In details, that which made him one of the greatest anatomists of his age, made him also the greatest draughtsman of the human figure.

Professor Whewell, once Master of Trinity College, Cambridge, was unsurpassed as a scholar, and yet it is said there was absolutely no subject that could ever be brought forward that he did not show himself intimately acquainted with.

Mr. Gladstone is not a less efficient statesman because he is also a Greek scholar, nor will he love freedom less in his own country because he once examined the prisons of Naples at some pains and not without effect.

An architect who is equal to the duties of his profession must know as much about each trade employed in the erection of a building as the workman who does the work in each, and able in each to tell good work from bad. If, in addition to all this, he studies incidentally such matters as ventilation, acoustics, sanitary laws, land laws, geology, brick-making, forestry, chemistry, and a few other kindred subjects, he will be none the worse fitted to build us a comfortable house.

I am not so speaking because I would offer any encouragement to the frivolous or discontented to change their occupations, or take interest in anything or everything besides their own work. That is a very different sort of thing, and I do not think any man has a right to enlarge the area of his studies until he has at least learnt his own business so well that he can honorably support himself by it. But when he has so acquired his craft, I do say that the more he broadens the basis of his knowledge the better, and the more likely he is to arrive at intellectual or professional greatness.

Besides this, who can know the extent of their powers until they have been tried? Many of the most brilliant geniuses have hit upon the road to eminence while studying quite a different subject to that they were employed at. Giotto began life as a shepherd boy, Sir Francis Chantry as a milkman, John Gibson as a stone-mason, Sir William Herschel as a militiaman oboe-player; and had they stuck to their original callings, they at least would have fared the worse, and society lost some of its brightest ornaments. Although it is well to remember that "the rolling stone gathers no moss," it is not wise to forget that "the tethered donkey is in danger of starvation."

The universal characteristic of all great work, whether in art, science, or literature, is the impression it gives of having been done easily. The touch of a great master seems the easiest thing in the world, if you see him apply it, and the only marvel is why everybody cannot do it as well. The apparent simplicity and absence of effort with which Halle plays, or John Bright speaks, seems to imply that they take very little trouble about it. Very likely not, because their failures were made some few years ago, and we only see their successes. After a writing-master has been writing copper-plate for a quarter of a century, it becomes an absolute impossibility for him to write a bad hand at all, even should he want to do so.

So long as we remain without wings, there is only one way to the top of a ladder, and that is up the steps; and if, when you are surveying the exalted position of some one at the top, you are told that the man was born there, or descended to his perch in some mysterious way from the skies, you will be justified in not believing that story. There may be many paths that lead to the same platform, but they are all steep, and though it may take a firm step, a steady eye, a cool head, and some physical exertion to arrive at the terminus above us, nature has been good enough to supply most of us with feet and eyes and heads and muscles, which may be used firmly or weakly,

steadily or waveringly, coolly or excitedly, according to our own desires. Only of this we may rest assured, that great men have always used their feet, eyes, and hands one way, and little men the opposite way, or not used them at all. So it always has been, and so we are justified in believing it always will be, so long as the human race remains as tenants in possession of this little world.

And now, thanking you all for the way in which you have listened to me to-night, to what I fear has been rather a sermonizing and moralizing discourse, I will conclude by apologizing to you for the fragmentary manner in which the subject has been brought before you. When I began to prepare this lecture, I found that if I attempted to cover the whole ground of my subject, I could do nothing but tell anecdotes and mention names. I have tried, rather, that my utterances, however imperfect, should be to some extent original, and to the whole extent my own honest belief. If you have come to me for bread and I have given you but a rugged stone, you have come to a mason instead of to a baker, but to a mason who is in as great a need of the bread you seek as any of yourselves.

That which I have learned, and desire to impress upon you, is that greatness is the result alone of labor, courage, and perseverance ; and that intellectual and professional pre-eminence without moral greatness is a very short-lived thing ; that men setting out with a desire for celebrity only, and prepared to sacrifice all to attain it, are precisely those who never realize their dreams. Short cuts are proverbially long roads, and that which honest labor turns into fame, becomes in the hands of those who desire only celebrity a temporary notoriety.

There is nothing more prolific of distinction and true greatness, than that men should have a clearly-defined object in life, and that it should be a good object, contributing to the welfare of society as well as to their own advancement. And there is no truer sign of the likelihood of attaining it, than that a man should subordinate his own desires utterly and completely to his object in life. No indication of moral greatness is more reliable than a spirit of toleration for the opinions of others, and whilst preserving our own independence to do so without offending the consciences or sacrificing the independence of others. To remember also that however remotely descended or distantly connected, we are children of a common parent, with brotherly and sisterly blood flowing in our veins, and that though it is our business to conquer the earth and subdue it, it is none of our business to conquer and subdue one another. That in the human family, as in the human body, if one member suffer all the members should suffer with it ; if one member rejoice all the members should rejoice together ; and that thus high and low, rich and poor, in life and in art, one with another should bear each other's burdens, and thus in our objects, our lives, and our actions endeavor to live up to the standard of our great men.

II.

FRESCO, ENCAUSTIC, ETC.

I PROPOSE, in this lecture, to give you some account of ancient and modern methods of wall-painting, such as fresco, encaustic, and stereochromy or water-glass. Encaustic painting, an ancient method whose processes are not clearly understood, may be said to be altogether obsolete. Fresco painting is both an ancient and a modern method, perfectly understood at the present time, but fallen much into disuse, not only because the taste of the present day is adapted to a class of subjects unsuited to its high and legitimate uses, but also because it is liable to suffer under the influences of climate and atmosphere. Stereochromy, or water-glass painting, is a modern German method, which claims to be an all-sufficient substitute for fresco, and to possess the superior advantage of indestructibility. I believe that no such thing as a fresco painting exists in this country; certainly we have never had an American fresco painter, and this for several reasons. Fresco painting is only suited to high art or to the noblest style of decorative art, and our painters know little of either. Even if they did, they could find but little opportunity to exercise their knowledge in the present condition of things. Our private houses are not on the scale of Italian palaces, and when of unusual dimensions, are not inhabited by persons inclined to spend money in adorning their walls with great mural paintings of historical or religious subjects. Our public buildings, as, for instance, the Capitol at Washington, would be admirably suited to the purpose; but I fear that we shall have to wait a long while before our legislators are ready to engage the services of an artist capable of covering their walls with paintings of great national subjects, in fresco or water-glass. Fresco painting, like lyric poetry, does not suit the spirit of the time. The public turns a cold shoulder upon historical and religious pictures; it wants to be amused and diverted rather than to be elevated and instructed by art; it has lost the conviction which former ages held, that art is intended not only to give pleasure to the eye but to elevate and ennoble the human creature, and does not look to it for the expression of high thoughts and the inculcation of high lessons. Certain it is that the efforts made to revive fresco painting, and to paint in water-glass at Munich and Berlin, and, later, in England, have not resulted in a way to make the lover of really high art very confident as to the wisdom of spending large sums of money upon mural

paintings. The artists of the day are not educated up to the standard of the great fresco painters of the sixteenth century, and when they are called upon to show what they can do with such subjects as Raphael and Michelangelo dealt with—the only legitimate subjects for fresco painting—achieve but little success. As compared with the great Italians of the cinquecento, Kaulbach and Cornelius and Maclise and Watts are, like so many Phaetons trying to drive the chariot of the sun, and, for the most part, come to a like end when they attempt fresco, which, to all intents and purposes, is as dead a language as encaustic painting, for the reason already stated,—that it is only fitted for the expression of a class of subjects which the realistic painters of our time are incapable of dealing with, and with which the public has but little sympathy. Modern art is essentially imitative; it produces fine portraits and landscapes and *genre* pictures, but it fails in works which demand an ideal treatment. Now, the processes of fresco are incompatible with imitation; they are only suited to the capabilities of an artist whose technical training and whose knowledge of the laws of composition, of light and shade, of color and of form, are of the highest kind, and so thoroughly in his grasp that he can use them rapidly, boldly, and, as it were, intuitively. He can make his cartoon as elaborate a piece of work as he pleases; but when he sits down before the bit of wet, freshly-mortared wall, prepared for his day's work, he must be able to paint flesh, draperies, accessories, *alla prima*, as you would write a letter, with the certainty that he cannot count upon retouching to any considerable extent, and that therefore what is to be done must be done surely and quickly. Few artists now-a-days are sufficiently well trained to work as the old painters did. They are accustomed to paint every part of their pictures directly from nature, and when they rely on their memories for anything more than a sketch, show them to be but scantily furnished with the solid knowledge required to paint a figure so perfectly that it will need but few corrections. Again, a master cannot be aided, as the artist was in old times, by pupils as obedient to his guidance and as absolutely under his control as if they were so many parts of himself. The old system of apprenticeship made the artist a Briareus,—gave him ten pairs of hands instead of one, and at the same time educated those extra hands so thoroughly that in time they became as technically skilful as his own. In the modern system, by which the student is either trained in an academy or self-taught, he occupies an absolutely isolated position, works out his own undisciplined individuality, if he have any, and grows up with incomplete training and with vague principles concerning the laws of beauty and the principles of composition. The result is what we all see in modern art, which, under pain of failure, is forced to renounce the ideal and deal only with the real. If I allowed myself to pursue this subject I should fill this lecture with a disquisition upon the disadvantages under which the modern world labors in all that relates to art of the highest kind; but this is not what I wish to talk to you about to-day. My object is simply to describe the methods of wall-painting, which were formerly means to immortal ends, and to give you a sketch of their development.

To paint in fresco is to paint upon a wet, freshly-mortared wall. This wall must undergo a certain preparation. We will suppose it to be of brick. A rough coat of plaster made of river-sand and lime, is spread upon it, in proportions which vary in different climates. (In Italy, two parts of sand to one of lime are used.) Lime is made of limestone. According to the length of time which may have elapsed between its preparation and its use will be the amount of its causticity. If too caustic, it blisters; but a certain amount of causticity is necessary to give it adhesive firmness. Authorities differ as to the length of time necessary to make it exactly what it should be. Some say three months, others consider three years not too long. The wall, when it has its first rough coating, must be left to harden perfectly before another coat is applied. The longest period is the safest. When perfectly dry, a coat of somewhat finer mortar is applied, and this, too, is left to dry. It is now ready for the last coat, which is to be put on piecemeal, as the painter needs it; that is to say, each morning such a portion of the surface is covered with fresh mortar (which is of extreme fineness and of about the consistency of oil paint) as the painter can finish in his day's work. This is a matter of very nice calculation, as it is important for the painter to stop just on the outline of some object in his picture, such as the border of a piece of drapery, or the depth of a fold, where the dividing line may not be perceptible, as it would be, for instance, in the middle of a nude figure; for otherwise he runs the risk of marring his work, as he would do if he failed to match the tone of color as it was when freshly put on. What this was he can only judge by memory, for in drying the colors change, and that which has been painted for some hours, will have quite altered its appearance when the artist resumes his work on the following day. Before leaving his work in the evening, the fresco painter cuts away the edge of his day's work with a sharp knife. This cut must be brought against the wall-surface, not at a right but at an obtuse angle, in order that the mason may the better piece on the fresh plaster, so that it may bind well with that already painted, and not make a ridge. In reality, the surface upon which a fresco is painted, is made up of many pieces, put together like painted glass in a mediæval window, or like the bits of ivory in a Chinese puzzle. The absence or presence of obnoxious lines depends upon the smoothness with which the mason lays his plaster, and upon the skill of the painter in dividing his composition so that the dividing lines may fall in unimportant parts of the picture. There are, however, other possible blots upon the wall-surface which must be avoided. As it is important for the painter to work with certainty and speed, he must know exactly what he wants before he takes up the brush. First he makes a general sketch, then a series of studies of drapery, attitudes, etc. etc., then he prepares a cartoon, *i. e.* a large drawing in charcoal of exactly the size of the proposed fresco painting. He is now ready to begin operations upon the wall. Seated before the portion of wet plaster prepared for his day's work, he takes a piece of oiled paper, upon which the outline has been traced, and fastens it upon the plaster. Then with a pointed stick, a stylus of wood or ivory, he marks the outlines upon the wall through the paper, or else pricks out the

outlines on the tracing-paper, and powders them with a little bag of charcoal-dust. This operation leaves the outlines in black upon the wall, and is preferable to the first-named plan, because the indented lines made by the stylus, collect dust, and are apt to show with an unpleasant effect.

The painter can use neither vegetable nor animal colors, as these alter when combined with the fresh chalk. Among metallic colors some are to be avoided, as, *e.g.* white lead. This can be replaced by finely-ground chalk. All colors must be ground in pure water, without the use of any combining medium, as through subsequent chemical processes they afterwards unite with the plaster. By the burning of the chalk the carbonic acid is expelled from it, and by slacking it becomes a pure hydrate of lime. The presence of carbonic acid would cause the colors to blister, and would produce crystallizations upon the surface. It is an error to suppose that colors used on wet mortar sink any more deeply into the wet ground than colors used on a dry ground; the colored water does indeed penetrate more deeply, but the pigments do not. Another error is to suppose that the colors can be separated from the plaster only by destroying it, as also that the colors do not flake away in fresco. Several layers of color can be laid one above the other, and each of these layers may flake if they have been put on without sufficient precaution.

I have said that one of the great difficulties of fresco painting is that the work must be completed while the mortar is wet. It is, however, possible to make certain after changes, and this in two ways. The first way is to cut out the portion of the fresco with which the artist is not satisfied and paint it over again, after filling up the space with fresh mortar. The second is to wait until the wall is perfectly dry, and then retouch in distemper. Painting in tempera, distemper *à la détrempe* as the French say, is painting on a dry ground with water colors, with which a binding medium has been mixed. The original meaning of the word "tempera" is that of mixture, as of pigments with any more or less fluid medium. In its second and accepted sense it implies the use of a glutinous medium, as egg, size, and gums, binding substances originally soluble in water, as distinguishable from unctuous or oily mediums. In its proper acceptation it means painting with a vehicle or medium, in which yolk of egg is the chief ingredient. Yolk of egg may be mixed in equal quantities with the color, or the yolk and white may be beaten together and diluted with the milky juice expressed from the shoots of the fig-tree; or the yolk alone may be so diluted; or vinegar may be substituted for fig-tree juice. Until the introduction of oil painting which followed upon Van Eyck's discovery, all easel pictures were painted in tempera either upon panels, or upon linen stretched on panels. In our own day tempera is still employed in Russia, especially for religious pictures, also for the retouching of fresco, and conjointly with oil colors, as by Moritz von Schmidt in his wall decorations of the *foyer* of the new Opera House at Vienna. Helbig, who is the best authority upon the methods of painting known to the ancients, affirms (what has been doubted and disputed) that they both knew and practised fresco painting, following, however, a method which gave their

mural decorations a very different appearance from those of our own time.

In ancient times no less than six layers of mortar were spread upon the wall, making a much greater thickness than that which modern fresco painters are accustomed to paint on. These layers were successively laid on the wall while the under layer was still wet. Marble dust of increasing fineness was mixed with the three last layers; each one was beaten down, and, being polished, had a white and shining surface like marble. "The colors," says Vitruvius, "being applied on the moist stucco, instead of fading, preserve their freshness, because the chalk, having lost all its dampness in the furnace and being thirsty by reason of its dryness, pumps up eagerly everything which touches it, and, mingling with other substances, forms a composite body which in drying preserves the single qualities of each. The last layer, which was composed of marble pulverized to a powder, mixed with chalk or plaster, was about a finger deep. It was hard, white, and polished as a mirror." The ancients distinguished real fresco, what we call "*buon-fresco*," *i. e.* a painting on the wet wall, which they called *udo tectorio*, from dry fresco, *fresco secco*, that is, painting on a dry surface, or painting *in arido*. This latter process, which is analogous to distemper painting, is of course far less solid, because the colors are not, as in the first case, incorporated with the plaster upon which they are laid, but form a separate and thin layer upon its surface.

It is hardly necessary to say that a much greater amount of water was contained in the many layers of plaster which the ancients spread upon their walls than in the few which are applied in modern times, especially as each fresh layer was put on before the first had dried. It remained damp consequently for a much longer period, and thus the fresco painter was able to proceed much more slowly with his work, and could execute very complicated designs without being obliged, as in our modern system, to work piece by piece. The idea, then, that Pompeiian ornaments and pictures could not be executed in fresco, because it would have been impossible to paint large pictures and complicated ornaments before the ground dried, is an erroneous one.

While speaking on this subject I wish to say a few words upon the place which fresco painting held in the Roman world in the days of the Empire. Curiously enough, while in the modern world fresco painting is connected with the highest period of art, in the ancient it was associated with its downfall. The rapidity of execution and comparative cheapness of the process led to a neglect of easel or panel pictures, which in better times had been eagerly bought for immense prices, if painted by distinguished artists. Both in temples and in private houses in Greece, before the division of Alexander's great empire between his generals, easel pictures on panel were probably let into the fresco-painted walls as panel centres. They were not hung on the walls as in modern days, nor were they copied in fresco upon wall-panels as at Herculaneum and Pompeii, until the second half of the third century B. C. Then painted pilasters or arabesque borders took the place of the

real pilasters used in former times, and compositions were painted in fresco on the wall, where real pictures painted in encaustic on wood would have been formerly hung.

The modern custom of displaying pictures in rows, as we see them in our houses, was contrary to the antique spirit. This demanded that a room should be a unit, and to attain this end all the works of art in it were so arranged as to make their connection with each other and with the architecture of the room absolute. Hence the system of dividing the walls into panels in which easel pictures were enframed. When the cheaper system of painting the entire wall in fresco was adopted, *pinacotheks* or picture-galleries came into fashion. Our oldest description of a picture-gallery is that given by Petronius, writing in the time of Nero. "There," he says, "were the pictures of Zeuxis, still unspoiled by the wasting hand of time, and the sketches of Protogenes, rivalling Nature herself in truth. These I touched with a certain feeling of awe. I admired also the monochromes of Apelles, whose subtle outlines seemed imbued with life. Here the sublime eagle bore Ganymede to heaven, and there the innocent Hylas repulsed an amorous nymph. Further on Apollo cursed his guilty hands and crowned his unstrung lyre with the new-born flower."

The important principle of general unity, which was the basis of antique decoration, was not lost sight of even in the latter days to which the mural paintings at Pompeii belong. Thus in freshly unearthed chambers a peculiar harmony between the tone of the central picture and that of the surrounding wall is observable. If the wall is painted red, the panel subject is colored lightly with warm shadows; whereas, if the coloring of the wall be dark, almost black, it is painted in a low scale of color with correspondingly low-toned shadows. Being adapted to their surroundings, both in respect to tone as correlative to that of the surrounding wall, and to evenly distributed light falling upon them through openings in the roof, antique frescoes appear at a great disadvantage when seen, as at Naples, in the halls of a museum where the light falls full upon them. They suffer as some antique statues and all pediment groups do, by being placed on a level with the eye, and lighted in an entirely different way from that which the artist originally intended. For these reasons ancient paintings seem to us coarsely and hastily painted, and antique groups and single pediment figures look out of drawing. The very science of the artist, which enabled him to calculate exactly how a fresco should be painted to suit a certain place and light, or how a statue should be proportioned which was to be looked at from below, and, at a distance of thirty feet from the spectator, is rendered nugatory, and what were real beauties are turned into apparent defects. Neither art, as represented by existing remains, can be fairly appreciated at the present day. The Elgin marbles are shattered fragments of a mighty whole in which we dimly divine the splendor of what was, from that which still is. How glorious they once were we may safely assume, since even in their present mutilated condition they assert their invincible supremacy over all else that antiquity has bequeathed to us. As for painting, it has not

even the advantage of showing itself to us in original works by great masters, which, however degraded, still retain some sparks of heavenly fire. We know the pictures of Zeuxis and Protogenes and Parrhasius and Apelles only through the descriptions of Pausanias, Petronius, and Pliny, and through the supposed copies or reminiscences of their works which exist in the frescoes of Herculaneum and Pompeii. These cannot be positively traced, though there is little doubt that the clever fresco painters who decorated the walls of the houses of those buried cities, made use of the compositions of the great painters which had become consecrated in the eyes of the multitude. They either repeated them exactly, or slightly varied them by leaving out a figure or a group, or else abridged them.

Greeks, Etruscans, and Romans were accustomed to adopt the compositions of distinguished artists as typical treatments of well-known subjects, using them as they used forms of speech which had by usage become common property. As the painters or wall-decorators who worked in the Campanian cities often painted from memory without the help of sketches or models, these typical treatments were gradually modified, so that although there can be no doubt that many of their works are directly or indirectly connected with Hellenic originals, it is often difficult, if not impossible, to trace the connection.

The speed with which the decorators of the Empire worked and the technical skill which they possessed is apparent to any one who examines the mural paintings of the buried cities. Their minds were stored with an infinite variety of forms of ornament; their memories were enriched with the knowledge of great pictures; and their hands were trained to carry out the ideas of others, of which they had possessed themselves, with all the ease of an improvisation. They were like the great pianists of our own time, Rubinstein and Von Bulow, who can play through the works of any composer, from Haydn to Liszt, without notes, only that they allowed themselves to take liberties with the compositions of the great painters which would be justly looked upon as unpardonable if taken by pianists with those of the great musicians. In considering the subject of painting in ancient times, we must note that the medium of the great Greek painters, was not fresco, but tempera or encaustic. I have already explained the first, which was practised in modern times by great artists until the fifteenth century, in the latter part of which oil painting was introduced into Italy from Germany and soon superseded it. Encaustic painting, that is, painting with fire, if we translate the Greek word *ἐνκαύστον* literally, died out with the great Greek artists, and its processes are to a certain extent secrets to us. Our chief authorities about its methods are Pliny and Vitruvius, whose texts have from their obscurity given rise to an immense amount of discussion and explanation not altogether satisfactory. The standard work upon the subject is the "*Antica Arte*" of the Abbate Requeno, but as this may not be accessible to you, read the article "*Pittura*" in Smith's Dictionary, which contains general ideas upon the subject; and you may also consult upon this, as upon many other important points connected with ancient art, Müller's "*Ancient Art and Its Remains*," translated from the German by John Leitch (London, 1852).

Pliny speaks of three kinds of encaustic painting : —

1. The burning in of outlines on ivory tablets with the stylus or cestrum, a metal instrument, such as the ancients used for writing memoranda on wax tablets, pointed at one end and broad and flat at the other, — the pointed end for writing, and the flat end for erasing.
2. The applying of colored wax with hot pencil, and the after operation of blending and softening the tints together.
3. The painting of ships with brushes dipped in fluid wax mixed with pitch, which not only ornamented but protected them from the action of the salt water.

It seems tolerably certain that the great pictures of Apelles and his peers were painted with wet cold colors which were laid on with dissolved wax ; a small rod heated at one end was then passed along the surface to blend the colors together and to give them transparency and depth. The wax was boiled with mastic, in the proportion of two to five parts, and then allowed to cool. The wax itself, called Punic wax, was purified and bleached before it was used. Requeno [Vol. 1, p. 277] says that a Greek or Roman painter's studio was furnished with the following objects : Punic wax colors, brushes of silk, pans and boxes to hold tinted wax, mastic, and other resinous gums, bitumen, a sponge, wax candles, a basin of water to clean the brushes, clean towels, rods and styli of iron, waxed tablets to make sketches on, a mortar to grind the colors boiled with wax, ivory tablets, and an easel in the shape of a tripod. Thus furnished, the painter had all necessary materials for the three different methods of encaustic painting mentioned by Pliny.

We have none of the masterpieces of the great Greek painters to compare with those of our great painters, but we read descriptions of them in ancient authors as enthusiastic as those which are written nowadays of the pictures of the great Venetian painters ; and from what we know of the consummate taste and knowledge of the Greeks, we must believe that they did not misapply terms.

In reading them, however, we are at once struck with the fact that one of the great merits of the pictures of Zeuxis and Parrhasius was the illusion which they offered to the senses. To imitate nature so closely that not only birds but men may be deceived, is not only a thing impossible to our painters, but even if done would not place those who did it in the first rank. If it were so, the Dutch school would stand first in our estimation, and a Van Huysum or a Seyboldt or a Denner would rank above a Raphael. You must not, however, suppose that the great Greek painters confined themselves to such feats of color-juggling as those here referred to. These were feats of technical skill which were so surprising that they excited wonder and were recorded ; but Parrhasius won his title of a law-giver in art, not because he could paint a curtain so perfectly that Zeuxis even was taken in and put out his hand to raise it, but because he painted gods and heroes in such perfection that they became types to the artists who followed him.

If, as we gather from the stories above referred to, encaustic painting was capable of giving extraordinary illusive effects, it was also, as we know from

the descriptions of such a famous picture as the Venus Anadyomene of Apelles, capable of rendering the color and texture of flesh with marvellous beauty and truth. The paintings of Apelles and the sculptures of Lysippus were the culminating glories of pictorial and plastic art in the days of Alexander, and the technical perfection of one was evidently not at all surpassed or outdone by that of the other. The high grade occupied by the painters of easel pictures is pointed out by Pliny. They treated mythological and historic subjects in the noblest style, and were held in an esteem which was not accorded to such mural decorators as the artists who painted in fresco at Herculaneum and Pompeii. To a certain extent, however, mural paintings in fresco were assimilated to encaustic paintings in appearance, as an encaustic varnish was passed over them to preserve them and to give them brilliancy. This varnish, which was made of wax and mastic, was laid on and then cauterized or melted upon the surface by means of a brazier containing lighted coals. When we compare ancient frescoes, as we believe them to have been, and modern frescoes, we find that they little resembled each other, the only points in common being that both were painted on freshly-laid mortar, of great thickness and many coats in the one case, and of comparative thinness and laid on piecemeal in the other. While the ancient fresco presented a polished and marble-like or enamelled surface to the eye, the modern fresco is clear and transparent, non-absorbent of light, and therefore non-reflectant. To see an oil painting to advantage, indeed to see it at all, the spectator must see it in a proper light; whereas the fresco painting rather throws out light, and is thus peculiarly adapted for the decoration of dimly-illuminated churches and public buildings. The breadth of effect attainable, the quickness of hand necessary to its successful use, which gave a certain character of improvisation to the finished work, also recommended it to the great Italian painters. After the revival of painting in the thirteenth century, it superseded mosaic, which had long been the only method used for church decoration, and from Giotto to Raphael continued to be practised with wonderful results.

The preference of the Italians for frescoed wall decoration was one of the reasons why Gothic architecture never fully established itself in Italy, while the preference of the Northern nations for Gothic buildings was the reason why fresco never obtained favor north of the Alps. The Germans preferred tall lancet windows, filled with stained glass, which, by the transmission of colored light, painted the interior with shifting colors so long as the sun shone through them. The Italians, on the contrary, clinging to their old traditions, delighted in frescoed walls, and, that they might be seen, made wide openings in them, which are incompatible with Gothic exigencies. The history of fresco painting in Italy is really the true history of painting from the middle of the thirteenth to the latter half of the sixteenth century. It begins with the works of Cimabue and Giotto, at the Church of St. Francis at Assisi, and culminates in the splendid creations of Raphael at the Vatican, and of Michelangelo in the Sistine Chapel. What other art can boast such an illustrious lineage as this? Cimabue, Giotto, Orgagna, Masaccio,

Da Vinci, Perugino, Raphael, Razzi, Michelangelo, and after them the Caracci, Guido, Carlo Maratta, Pietro da Cortona, and Raphael Mengs ; nay, we need not stop here, for the art, as revived at Rome in the early part of this century, was practised by a group of young German painters who became famous, — Overbeck, Schadow, Cornelius, and Veit.

I suspect that the chief reason why this attempted German revival at Rome never led to any abiding result is that, of all styles of painting, fresco demands the most knowledge, and the most ready use of that knowledge, in the painter. The painter in tempera, in oil, in water color, the goldsmith, the sculptor, the engraver, may dawdle over his work as he will ; he may change it, and retouch it *ad libitum* ; he may leave it for years and take it up again without detriment to it. Not so the fresco painter : he must have his work all planned and thought out beforehand, like a general who is on the eve of a great battle, though, unlike him, he cannot hope to take advantage of the enemy's mistakes, and, by some suddenly-conceived change of plan, convert defeat into victory. The obstacles to his success are fixed, and he must rely upon the readiness of his hand and eye to overcome them. He must be a quick and good draughtsman and colorist ; he must know how the colors which he lays on the wet wall will look when they are dry, so that in beginning his next day's work on a freshly-laid piece of mortar he may not mismatch tints ; then again he must be able to undergo a considerable amount of physical fatigue and annoyance, — run the risk of catching cold and fever by working in damp places, all which risks and fatigues are greatly increased if he be employed in painting the ceiling of some great chapel or room. The standard example of the troubles of the fresco painter is that which is furnished by Michelangelo's account of his work at the Sistine Chapel. Cooped up in a narrow space between the top of a scaffolding and the ceiling, upon which he worked out the mighty figures of sibyls and prophets and genii, and portrayed the story of man's early history as related in the book of Genesis, he remained for months together a prisoner condemned to hard labor. So much was his sight affected by the necessarily abnormal position of his head, that for a long time after he had finished his work he could not read a book as ordinarily held, but was obliged to hold it up above his head. Did you ever read the sonnet which he wrote to his friend Giovanni da Pistoia in 1609 while working upon this ceiling ? On the margin of the original he made a sketch of himself in the position described in the sonnet : —

“I've grown a goitre by dwelling in this den,
As cats from stagnant dens in Lombardy
Or in whatever land they hap to be,
Which drives the belly close beneath the chin ;
My beard turns up to heaven, my nape falls in,
Fixed on my spine ; my breast-bone visibly
Grows like a harp ; a rich embroidery
Bedews my face from brush-drops thick and thin.

My loins into my paunch like levers grind ;
 My buttock like a crupper bears my weight ;
 My feet unguided wander to and fro ;
 In front my skin grows loose and long ; behind
 By bending it becomes more taut and straight.
 Backward I bend me like a Syrian bow,
 Whence false and quaint I know,
 Must be the fruit of squinting brain and eye ;
 For ill can aim the gun that bends awry !
 Come then, Giovanni, try
 To succor my dead pictures and my fame ;
 Since foul I fare, and painting is my shame."

I have often thought when visiting the Sistine Chapel that it would be very interesting to get near to the ceiling and examine Michelangelo's work near by ; but this is as impossible as it would be to reach the stars. One looks up at the mighty figures as one looks up at the planets in the firmament, and wonders, not what they are, but what they would look like, if one could get into their immediate neighborhood. Other frescoes by great Italians are more accessible, as, for instance, those of Raphael in the Stanze of the Vatican. The rooms are comparatively low, and the bottom of the fresco is only a few feet from the ground. To study them closely, or to copy single heads, an artist is permitted to use a ladder, with a platform at the top large enough to sit upon. I availed myself of this possibility a good many years ago while living in Rome, and made two studies from the Heliodorus which I have brought with me, — one of the head of the warrior on horseback who has overthrown the plunderer of the treasures of the Temple, and the other of the entire group, with the two messengers of divine vengeance, who swoop down like eagles upon their prey. The single head was copied, not from a distance as it was intended to be seen, but near by. The expression seems somewhat forced, and it is so in order that the spectator standing below may receive a strong impression. If you place yourself close to an orator speaking in a large hall, you will think he raises his voice too much, which indeed he does for you, but not for those who sit at a great distance from him. So a painter who speaks in colors from a distance must exaggerate expression and paint in broad masses, which will be effective at a distance. This is one of the points of difficulty which the fresco painter must know enough to overcome. He must be able to calculate his effects proportionately to the relative distance which is to intervene between them and those who are to see them. Michelangelo began his work at the Sistine Chapel on a miscalculation : the first panel which he painted, the Brazen Serpent, is, from the small scale on which the figures are painted, entirely ineffective from the floor of the chapel. Seeing this, the great artist conducted the remainder on a very different scale, and the result was a triumphant success.

The decline of fresco painting in Italy, where alone it ever really flourished, kept pace with the decline in art. With Raphael and Michelangelo and Corregio and the great Venetians it reached its apogee, precisely

because it is essentially the fittest form of painting for the expression of the high art of which they were the apostles. After them Domenichino at Grotto Ferrata, Guido in the Rospigliosi Palace, the Caracci at the Farnese, all painted frescoes of great merit; but then came the turn of such wall decorators as Luca fa Presto and Pietro da Cortona, who covered acres of walls with frescoes, painted with skill and wonderful facility, but mannered, extravagant, and void of style. Turned to such ignoble ends, the art died a lingering death, whose throes are not worth watching. It was revived, or, rather, galvanized into a seeming life, early in this century at Rome by a set of young German painters,—Cornelius, Overbeck, Schadow, and Veit,—who, under the patronage of the Crown Prince of Bavaria, afterward the famous King Louis, believed themselves destined to found a school which should be worthy to take rank with that of the sixteenth century, which had written its record in immortal shapes upon the walls of the Vatican, the Sistine Chapel, and the Farnesina. As fresco was the fitting language for the high art to which they devoted themselves, they desired to employ it. The Prussian Consul, Herr Bartholdy, placed one of the rooms in his apartments at the Palazzo Zuccheri in the Via Sistina at their disposal; and there Overbeck painted “Joseph sold by His Brethren,” Schadow, “Isaac receiving the News of Joseph’s Death,” Cornelius, “The Meeting of Joseph and Benjamin,” and Veit, “The Age of Iron and the Age of Silver.” Overbeck, Schadow, and Veit, late converts to Romanism, with others of their way of thinking, formed a party at Rome which went by the name of the Nazarene. They looked upon art as the servant of religion, led very simple lives, affected a certain austerity of demeanor, were, in short, neo-mystics, who copied as far as possible the style and sentiment of a bygone age. Thorwaldsen, Koch, and Schlick were the leaders of a pagan or classical party in art, who zealously studied the antique, and drew their nutriment from no other source. Cornelius stood midway between the two parties; he had been brought up in the Church of Rome, but, although thus naturally allied with the Nazarenes, he had such a horror of proselytism that he openly declared that he would become a Protestant as soon as the Nazarenes made their first convert to Romanism. The frescoes which Overbeck, Cornelius, and Schadow painted at the Palazzo Zuccheri are really interesting, because they are the first fruits of the unquestionable talent of the founders of a school who, though working on a false principle, were earnestly and devoutly convinced of the sanctity of their mission. They appear in them to much greater advantage than in their later works, because these are more and more disfigured with that mannerism which, especially in the case of Cornelius, as he appears in his illustrations of the Iliad at Munich, was the bane of their art. Of the three, Overbeck will, perhaps, live longest, though he was an anachronism in his art as in his appearance. Meeting him in the streets of Rome, or seeing him, as I have often seen him, in his studio, clad in a long purple robe bordered with gray fur, and with a cap of the same material and trimmings upon his head, you would have thought that he had stepped out of one of Holbein’s pictures. As he thus in his person affected the costume of a past time, so in

his works he repeated the outward pattern of a phase of art which holds that high place in man's esteem accorded to every genuine growth and vital expression of an age, but which cannot be given to any imitation, however cleverly accomplished, by men living in and belonging to a later period, whose thoughts, ideas, and aims are totally different. The later history of fresco painting takes us across the Alps to Bavaria. Here, under Louis of Bavaria, the hitherto unimportant capital of a small European kingdom became the nursery of the new German school. Munich was the stage upon which King Louis enacted the part of Leo X, surrounded by the counterfeit presentments of the great Italian artists who made Rome really what this new centre of the arts aspired to be. Van Klenze, the architect, played the part of Bramante, Schwanthaler, the sculptor, that of Michelangelo, while Cornelius, Hess, Julius Schnorr, and Kaulbach completed the troupe as the modern representatives of Raphael and his scholars. These men, by their buildings, statues, and frescoes, made Munich what it is, — a pale copy of the Rome and Florence of the sixteenth century, oddly jumbled with reminiscences of other centuries in Italy and Greece. As one walks about its streets one feels as if in a dream, so disconnected are these reminiscences and so mixed up with the antagonisms of modern life. Here is a Basilica, there an exact copy of the Loggia of Orgagna at Florence; the theatre is called the Odeon, the picture-gallery the Pinacothek, and the sculpture-gallery, which is the most perfect reproduction of a Greek building attempted in modern times, is known as the Glyptothek. The great buildings are adorned with frescoes whose subjects are taken from the Iliad, from the lives of saints and martyrs, from German history, from the works of poets, ancient and modern. The frescoes, with which we have more especially to do, are complicated and mannered in design and crude and disagreeable in color. Among them, those of Professor Hess, in the Basilica, are by far the best; those of Cornelius, the worst in design, color, and taste.

Even under the most favorable circumstances as regards climate and freedom from the destructive influences of dampness, smoke, acid, vapors, etc. etc., frescoes fade and change with time. If this be the case in Italy, for instance, it is greatly aggravated in more northern countries, such as Bavaria, where great alternations of heat and cold prevail. To decorate the exterior of buildings with frescoes, as the German artists employed by King Louis attempted to do, was merely to throw away time and labor; and this led to the invention of a new method of mural decoration, which, however inferior in quality to fresco painting, claims the advantage of indestructibility. I refer to stereochromy or water-glass painting, which was employed by Kaulbach for the great wall paintings which he executed in the new museum at Berlin. The word stereochromy is derived from two Greek words, στερεός, solid, firm, and χρώμα, color. Water-glass is soluble alkaline silicate, — *i. e.* silicate (fluid) rendered soluble by boiling it with an alkali, such as potash, soda, or lime. This fluid glass (for it is really nothing but ordinary glass in a different form) is infused into the wall through its facial painting. The mortar spread upon the wall is composed of quartz, sand, and lime, all

which are ingredients of glass; these ingredients in glass are chemically united, whereas in plaster they are held together by virtue of the common law of cohesive attraction. The principle, then, of the whole operation is the homœopathic principle of "*Similis similibus*,"—like to like. The plaster drinks in the water-glass, for which it has a natural appetency, and the whole becomes a solid mass of which the colors used in painting before the water-glass is applied form a component part. These details of the new process are taken from a report made by Daniel Maclise, the well-known English historical painter, for the "Commissions on the Fine Arts." Maclise visited Munich and Berlin, saw Kaulbach and his pupils at work, and made many experiments with a view to the decoration of the new Houses of Parliament by the same method. Had these decorations by Maclise, Herbert, and other English artists been less weak and unsatisfactory than they are, we should have less reason to deplore the fact that, being painted in a material over which time and climate have no power, they are likely to last, unless deliberately destroyed. This is a misfortune, for to him who has seen them once, no desire remains to see them again.

Mr. Layard, who was one of the most earnest promoters of the proposed decoration of the Houses of Parliament, in a paper read before the Royal Institute of British Architects, states that some of the frescoes had hardly been painted in the Houses of Parliament before decay commenced, and many of them, he adds, "are even already almost gone." This was not due to any defect in the materials, but to the insidious attacks of London smoke, against which even water-glass, as he fears, will not be able to stand. The opinion of Dr. Percy, whose opinion Mr. Layard quotes as that of one who had formed it after careful scientific examination and analysis, is "that no wall painting, however executed, can resist an atmosphere impregnated as that of London is with the chemical substances evolved from the consumption of coal." Convinced of the correctness of this opinion, Mr. Layard turned his attention to glass mosaic, brought over from Italy to England, and thus introduced a method of decorating walls, externally or internally, which even the London atmosphere, that "*edax rerum omnium*," will, it is to be supposed, find it hard to digest.

III.

COLOR: THE ORIGIN OF PIGMENTS AND THEIR CHEMICAL ACTION.

COLOR is the immaterial result of the decomposition of light by material substances. It is a soul-element, as it were, of matter, revealed through things which are "of the earth, earthy," and made known to us by that great interpreter of mysterious phenomena called Chemistry. It is presented to us independent of substance only in the image of the prismatic spectrum.

The physical bases which decompose light, thereby enabling us to determine the character of its constituent properties, are called pigments. These are either simple and original, as Nature gives them to us, or they are the result of chemical change and combination, the former being generally considered superior. While she supplies them abundantly from all her store-houses, by far the largest number are of mineral origin, either haloid compounds of various metals or certain insoluble salts of these.

Most commonly oxides constitute paints — as in the case of the ochre tribe, from yellow to purple — and chemical combinations of oxides; also chlorides, iodides, sulphides, carbonates, phosphates, chromates, acetates, etc. Many, also, are derived from the vegetable and animal kingdoms, either directly — as sepia from the cuttle-fish, and certain colored resins, as gamboge, etc., from plants — or indirectly, through chemical agency.

Under certain conditions, pigments are subject to peculiar accidental changes, — gradual sometimes, sometimes immediate. These are generally occasioned by careless combination of inimical substances, by reciprocal action or by foul air, gases, dampness, etc.

Unfortunately, pigments are especially liable to come in contact with the last three foes mentioned directly they are placed upon any work of art; hence, it behooves all possible Turners to take heed lest history repeat itself, and darkened chromate-of-lead-skies continue to be contrasted with "the pure limpidity" of those "ever luminous" ones of Claude. But perhaps the danger least guarded against, because least considered, is the indiscriminate mixture of pigments, the results of which are occasionally unexpected, not to say undesirable.

In view of this, before admitting any pigment to such a place of trust as the palette, a close investigation into the manners and customs of each separate species would doubtless not be injudicious. A cursory glance, therefore, at the individual peculiarities of a large number of those in most general use will follow hereafter. While some hold letters patent from high authorities, there are yet many with doubtful credentials, whose worthiness of public confidence time only can establish.

Many very beautiful colors have within a few years been prepared from coal-tar, but proving unstable, they are now seldom used except for dyeing purposes. Among these, the brilliant mauve, magenta, and azuline may be mentioned as examples.

The most permanent colors are the earths and ochres, and such mineral substances as are not destroyed by fire and lime. Some of these, unhappily, are less beautiful than many of the fugitive ones, and in consequence, it often happens that discretion is not the better part of painting.

The terms "permanent" and "fugitive" have no absolute, only a relative signification; for instance, ultramarine, which will endure a hundred centuries, under ordinary circumstances, may be destroyed in a moment by a drop of lemon; and the generally fugitive carmine, if hidden under a bushel, hermetically sealed, and put just where one would never want to put it, will last for ages. Again, white lead, extremely sensitive to the quality of the atmosphere, will retain its whiteness for almost any length of time in pure air, only to blacken after a few hours' or days' exposure to foul air. Pure air and sunshine will restore it, however, as will also an application of oxygenated water.

It has been supposed, and not unreasonably, that pigments, protected by oils and varnishes, were safe from any possibility of change. The assumption would be warranted if we had an impenetrable varnish; and even that would not resist the action of light, though it might resist dampness and impure air. Moreover, the varnishes and oils themselves have a tendency to darken (thereby obscuring) what it is pretended they keep from obscurity.

With regard to permanency, the good repute of many permanent pigments is often injured by careless admixture of fugitive ones. To this latter class belong a large number that are transparent, as the cochineal lakes, the yellow dyewood lakes, and such as are of organic origin.

While it is the tendency of transparent pigments to fade, those earthy and metallic are inclined to darken, yet both are essential to good painting.

Beginning with the neutrals, black and white, which are said to comprehend the synthesis and analysis of all color, we will now notice some of the chemical relations and characteristics of pigments individually.

Good whites are especially essential to the artist, as they form the basis of all opaque painting.

Flake white, having more body than any other white, hence preferable, is a carbonate of lead, with an excess of oxide, prepared by exposing thin sheets of blue lead to the fumes of vinegar, in beds of fermenting tan.

It is necessary to use a rapidly drying vehicle with all white leads, as they

are always endangered by foul air and gases. Millions of dollars have been expended in trying to find a substitute for them.

Zinc white, an oxide of zinc, unaffected by bad air and gases, may be used over lead whites, but it is too feeble in body to take the place of them.

The brightest white used in oil is Kremnitz, also a carbonate of lead lacking body. All lead whites are carbonates of that metal, except Flemish white, which is a sulphate, and Pattison's white, which is an oxychloride. The latter is partially soluble in water, therefore ineligible.

Lead whites cannot be used in water color, fresco, or distemper, as they require the protection of oil or varnish.

The only white possessing both body and permanence is Chinese white, an oxide of zinc, not used in oil.

BLACK. — The coloring principle of all black pigments is charcoal or carbon.

Black lead, plumbago, or graphite contains no lead whatever, only carbon ; some iron, perhaps, with a trace of silica or alumina.

Blue black is composed of calcined vine-stalks, etc., and is very durable. A small quantity mixed with white lead will act as a preservative. This is owing to a bleaching power which carbon possesses.

Ivory black is animal charcoal, or ivory calcined by strong heat in close vessels. It must not be mixed with vegetable or organic pigments in water, as it has a power to absorb such substances. Put into a solution of them, it will, in time, render the water quite clear and limpid.

Various accounts are given of the mode of preparing the Chinese product Indian Ink, but according to analysis it possesses the properties of lamp-black largely, some sepia, and about two per cent of camphor. Bone-black and lamp-black are what their names suggest, — calcined bones and soot from resinous woods. Manganese black is an oxide of that metal ; it has great body, and is the best of all blacks for drying in oil.

YELLOW. — Yellow, the first primary, is found in abundance everywhere, yet for some reason very little was used among the ancients, its place being supplied by gold. In its chemical relations it very much resembles white. Nature, rarely so prodigal with her gifts of excellence as to bestow a multiplicity upon one object, has been peculiarly lavish to two of this class — aureolin and orient yellow.

Aureolin is said to be the most perfect color in existence, approaching more nearly than any other the purity of the prismatic spectrum. It is available in all branches of art, except in enamel. Great heat destroys it, notwithstanding which it will bear the direct rays of the sun for a whole season. It mixes safely with all other colors.

Orient yellow, its compeer, merits equal praise ; lustrous, luminous, permanent, it defies all enemies. They are both new pigments.

The cadmiums are also comparatively new, the metal itself being unknown before 1818. They are sulphides of cadmium, unaffected by impure air ; iron injures them, hence a steel palette-knife should not be used with them. Deep cadmium, mixed with white, gives a perfect imitation of Naples yellow.

Opinions differ with regard to mixing it with white lead, some authorities contending that it would be destroyed thereby.

Lemon cadmiums are decidedly fugitive, though of the same nature as deep orange cadmiums, which are permanent.

Chrome yellows are chromates of lead, having great body, brilliance, and opacity. They lack tenderness, and will in time grow dark; they are less affected by foul gas in oil than in water color; they destroy Prussian and Antwerp blues.

Citron yellow is chromate of zinc; affected by light and air; liable to turn green if brought in contact with organic substances.

Gall stone, an animal product, is affected by strong light. Gamboge, a gummy, resinous product, is transparent, and more durable than it has the credit of being. When mixed with other colors it helps preserve them, on account of its resinous nature. It is injured by white lead and other metallic pigments, and reddens by contact with alkaline substances.

Indian yellow is an animal product. Possessing an alkaline nature it injures cochineal lakes and carmine. It may be employed in fresco, as foul air and lime do not harm it. Like some other pigments, it resists the sun's rays, but fades somewhat in ordinary light.

Lemon yellow is chromate of baryta, the only chromate which is not liable to change by foul air, dampness, mixture with white lead and other pigments, the action of light, and contact with a steel palette-knife. It is semi-opaque.

Mars yellow resembles the iron ochres and sienna earths, but is more transparent, and somewhat purer and richer.

Most of the modern Naples yellow, having a zinc instead of a lead basis, is stable and trustworthy. It was formerly a compound of lead and antimony, subject to same dangers and management as white leads.

The ochres are native earths, in which iron is the coloring element. They are compounds of silica, alumina, and iron.

The umbers, siennas, and ochres are all oxides of iron, and permanent, whether native or calcined.

The ochres were chiefly used by the old masters for flesh-tints, and their permanency is proved by the state of old pictures. They injure carmine and cochineal lakes to some extent.

Orpiment is sulphuret of arsenic. It is destroyed by lead colors, and deprives other colors of their oxygen. It is now obsolete.

Strontian yellow should be chromate of strontia, but it is not. It contains no strontia whatever, and is an exceptional instance of a compound superior to an original pigment.

Vegetable yellows are not to be depended on, especially if submitted to the action of solar rays. The same may be said of vegetable pigments of all colors.

RED.—With the second primary, red,—red, the gorgeous, the magnificent,—Nature has less richly endowed us. Yet our lack is not in quantity, as we have an abundance, but rather in the union of excellences of which the first primary

gave us examples. Especially are we in need of a transparent, permanent scarlet. The only pure scarlet available is an iodide of mercury, as much inferior to vermilion in permanence as it is superior in brilliance. It must not be mixed with metallic pigments, and must be thickly glazed with gum in water color.

Vermilion is a sulphuret of mercury, — mercury and sulphur sublimed together. In China it is found so pure as only to need grinding. It is permanent, if of the best quality, and eligible in water, oil, or fresco. Its opacity is its greatest objection. It is too suggestive of the word “pigment,” — paint. When mixed with other colors, the heavier they are the better, as its specific gravity is great. Mixed with white, it furnishes fine flesh tints. It is not good in enamel, as it is dissipated at red heat. It contains about 100 parts quicksilver to 16 parts of sulphur.

Beside vermilion, there is one other red, not bearing on a crimson cast which is permanent, and eligible in every department of art, except, also, enamelling. This is cadmium, a simple, original pigment. Glazed with madder-carmine, it is the best known substitute for scarlet.

Carmine, one of the pink or crimson reds, is prepared by adding alum and carbonate of soda to a solution of cochineal. The cochineal insects, from which the color is obtained, are fed on cactus plants and tended with as much care as silk-worms. They are natives of Mexico, and some frightfully mathematical brain has estimated that it would take 70,000 of them to weigh a pound. Carmine is unstable, unless used very thickly, and is changed to purple by contact with alkaline substances. Crimson lake, scarlet lake, Florentine and purple lakes are all cochineal colors, and fugitive.

The madders are derived from a plant largely grown in France and Holland, and are a most valuable acquisition to the palette, as before their discovery there was no permanent transparent red and rose pigment. Unlike cochineal, madder furnishes several coloring matters, — yellow, orange, red, purple, and brown.

Mars red is an artificial iron ochre, similar to the native earth. All the Mars colors are good and permanent.

Red ochre, oxide of iron, is either yellow ochre burnt or the same changed in hue by time, which often has the effect of fire. Like all ochres, it is permanent in water, oil, crayon, or fresco, and, like most of them, available in enamelling.

Indian red is an earth brought from Bengal, and contains a large amount of peroxide of iron. It is opaque, and does not keep place well, but neither time, fire, impure air, light, nor mixture with other pigments will affect it.

Light red is an ochre, but Venetian red cannot properly be classed among them, as it has no earthy base. It is artificially prepared by calcining sulphate of iron. It is permanent, but should be cautiously used with colors which affect that metal.

Red lead, an ancient pigment, is an oxide of uncertain composition, extremely fugacious when employed with white lead.

Among the permanent reds rank cadmium, madder, and Mars reds, and

the ochres and vermilions; among the semi-stable, the cochineal lakes, Indian lake, and red chrome. To the fugitive, belong scarlet, dragon's blood, red lead, and coal-tar colors.

BLUE. — Among the blues we have, as yet, only two classes that can properly be called permanent, — the ultramarines, native and artificial, and the cobalts.

Pure ultramarine is derived from the precious stones, lapis-lazuli, found in Persia and in Siberia; it is doubtless the celebrated Armenian blue. It is very expensive; the purest quality of it has been sold as high as £8 an ounce. On account of its costliness, a prize of 6000 francs was offered in Paris for an artificial substitute that should possess its good qualities. This was won in 1828 by a M. Guimet, a noted chemist. Its absolutely necessary constituents were found to be silica, alumina, sulphur, and soda, the blue color being dependent on the soda. It has a transparent, azure color; it is permanent, unaffected by alkaline substances, hence eligible for mural decoration, and is subject to the same effects from acid as the native ultramarine. It becomes darkened by heat, which renders it unfit for painting on porcelain or glass. It must not be mixed with constant white, which is an acid sulphate of baryta.

Cerulean is comparatively a new pigment; it is cobalt with a tin base, and contains sometimes gypsum, silica, and magnesia; it has a chalky quality which destroys its transparency. Like all cobalt blues it assumes a greenish-gray tint in time, and like them it resists the action of light and impure air, although, owing to its tin base, it is more open to the influence of the latter. It can safely be employed in fresco and enamel.

Cobalt is obtained by calcining a mixture of alumina and crystals of cobalt. The perfection of the color depends on its being free from iron and nickel. It does not suffer from mixture generally, and can be used in enamel and fresco. Its specific gravity is great, which causes it to sink quickly when mixed for use with other colors. A prismatic effect can be realized by going over it when dry with a faint wash of vermilion. It is not destroyed by acid.

Smalt is a vitreous compound of cobalt and silica, stable in glass or porcelain painting, but not for pictorial purposes, either in oil or water. All vitreous colors are unsuited for artists' purposes.

Indigo came into use in Europe about the middle of the sixteenth century, although it was well known to the ancients. Permanent as a dye, it is even inferior to Prussian blue as a pigment; but it is in favor with many artists, notwithstanding, since it gives good effects.

Intense blue is only refined indigo.

Prussian blue is a compound of iron and potassium, or a prussiate of iron with a gaseous substance called cyanogen. It fades in a strong light, but regains its color in the dark; it dries well in oil, and can be used in great body with considerable permanence.

Antwerp blue is a species of lake with an aluminous base. Similar to Prussian blue.

Blue verditer is blue oxide of copper.

GREEN. — Copper furnishes many of the most commonly used greens. But all copper greens are somewhat insecure in oil vehicles.

Scheele's green is an arsenite of copper, a late discovery, intensely brilliant and rankly poisonous.

Emerald green is a compound of arsenite and acetate of copper. It is very durable, not affected by light, dampness, or impure air; it is powerfully reflective, and is to greens what scarlet is to reds. It may be mixed with aureolin for Spring tints.

Malachite green is carbonate of copper. It is prepared from malachite, a beautiful copper ore used by jewellers.

Viridian green, a new preparation, and the most beautiful of all greens, is an oxide of chromium. Pure and clear as an emerald, it is also permanent, and mixes safely with other pigments, neither injuring nor injured by them. Unaffected by impure air or dampness, it is eligible for fresco but not for enamelling. With aureolin, it is peculiarly adapted for marine painting.

Oxide of chromium is chromate of mercury strongly ignited. It is a permanent color in all respects; it is the coloring matter of emeralds; it is opaque and of full body.

Terre verte is an oxide of copper.

Chrome greens are compounds of chromate of lead and Prussian blue, but they are unfit for artistic purposes, as their constituent elements react upon each other.

Hooker's green is simply a compound of Prussian blue and gamboge.

PURPLE. — The richest purples are mixtures of Prussian blue and crimson, but are, of course, unstable, since their component parts are so.

Purple madder is the only durable organic purple, and is admirable for fresco.

Violet carmine should be used only in body, as it loses its beauty and brightness.

Gold purple is excellent, but costly, and purple madder supplies its place.

Because of its great beauty and high cost, purple came to be the symbol of imperial power. The celebrated Tyrian purple was obtained from a species of murex, and other shells. The Romans had extensive murex fisheries and dyeing establishments, but for several centuries after the fall of the Roman Empire purple was an unknown color in Europe.

Mars violet is strictly permanent, and is of an ochreous nature. It is not very brilliant.

ORANGE. — Orange pigments comprise some of the best on the palette, though they were unknown in ancient times.

Cadmium orange was first introduced to the art-world in 1862. It is a simple original color, having no base but cadmium. Beautifully transparent, it gives gorgeous effects, and is especially adapted for a glaze over autumn leaves and for bits of bright drapery; it can also be used for mural decoration.

Orange chrome is produced by the action of an alkali on chrome yellow. Like all chromates of lead, it has a tendency to injure organic substances.

Of the tertiary colors, there is no original olive pigment, good or bad, and only one original russet, — Ruben's madder.

Olive oxide of chromium is of strict durability, either in water or oil. It is superior to any compound olive pigment, but is too expensive to be used freely. Olive terre verte is good, and is semi-transparent.

In brown pigments, yellow is the chief constituent, and with the exception of Cologne and Cassel earths they are comparatively permanent. Brown pink, however, a citrine color of vegetable origin, is not very stable. Mars brown is iron and manganese, and quite permanent. Vandyke brown is a bituminous ochre, and like all bituminous pigments dries tardily.

Bitumen and asphaltum are both of a resinous nature, the one mixed with oil and the other with turpentine. The pitch is found floating on the Dead Sea ; its great transparency renders its use very tempting to the artist, notwithstanding it has a tendency to crack on change of temperature. Mummy oil used with it, however, will prevent its cracking. The large seams in some of Sir Joshua Reynolds' pictures are said to be the result of painting freely with bitumen.

Mummy brown comes from the catacombs of Egypt. It is the liquid bitumen which was used in embalming, chemically changed by time and mixture with animal remains. Objections to this pigment are sometimes raised on rather novel grounds, though whether they are the result of sentimental reverence or disgust is open to conjecture. Field instances a certain artist who had a decided prejudice against smearing his canvas with a possible extract of Potiphar's wife, notwithstanding he might get excellent effects thereby.

Sepia is the concrete gall of the cuttle-fish. It is capable of being so widely spread that an ounce of it will color several thousand ounces of water. It is very permanent and combines admirably with other pigments. A fossil cuttle-fish was recently found, the ink in the gall-sac of which was in a perfect state of preservation.

Verona brown, a citrine color of great service, is a ferruginous earth. The citrine-bistre is a solution from the soot of burnt wood. As it attracts moisture from the atmosphere, it is not considered good except for architectural drawing, and is not used at all in oil.

Raw umber is a natural ochre, containing oxide of iron, oxide of manganese, silica, and alumina. It dries well, is stable, and does not injure other pigments.

Cappagh brown is bog-earth and manganese. With an excess of peat, it is a superior Vandyke, and with an excess of mineral it forms a superior umber.

Cadmium brown is white carbonate of cadmium prepared by ignition. Its use is not recommended, as it will change back to white by contact with air.

The following is a list of pigments which are not at all, or little, liable to injury by the action of light, oxygen, and pure air ; nor by shade, sulphuretted hydrogen, dampness, and impure air ; nor by the action of the metallic substances, lead and iron : —

Zinc white, constant white, tin white, the yellow ochres, red ochre, light red, Venetian red, Indian red, ultramarine, blue ochre, orange ochre, jaune de Mars, burnt sienna, burnt Roman ochre, terre verte, cobalt green, gold purple, madder purple, purple ochre, brown madder, Vandyke brown, bistre, raw and burnt umber, Cassel earth, Cologne earth, sienna earths, vermilion, rubiates or madder lakes, madder carmines, asphaltum, mummy brown, ultramarine ashes or mineral gray, sepia, manganese brown, Cappagh brown, ivory black, lamp black, Indian ink, graphite, mineral black, Frankfort black.

Pigments injured by white lead or preparations of that metal : —

Gamboge, Indian yellow, yellow lake, Italian pink, iodine scarlet, red lead, dragon's blood, lac, carmines and cochineal lakes, indigo, orange orpiment, sap green, brown pink.

Pigments affected by iron, or by other pigments into which ferruginous substances enter as components : —

Blanc d'Argent, Naples yellow, patent yellow, iodine scarlet, carmine, scarlet lake, blue verditer, intense blue, mountain blue, verdigris, green verditer, prussiate of copper. *cadmium* —

IV.

HARMONY AND CONTRAST OF COLOR.

COLOR seems to be a necessity of our intellectual nature ; for if all objects were of a bright white light when the sun shone, and this light gradually faded away into black dulness as the sun disappeared, giving us no variety of color but dull neutral grays, what unsatisfied, despairing creatures we should be ! It is this craving for color and beautiful effects which leads us to decorate our homes, our persons, and draws us to works of art. We go to Nature to study there what is spread before the eye of all intelligent beings, and learn what is agreeable in the works that she exhibits to us daily. She spreads ever-varying beauty before us ; and we are not forced to journey over many lands for variety of scene, for if we view the same landscape many times, it is never painted twice alike, and its colors are always in harmony. Then let us look more closely, and endeavor to see what it is in Nature's paintings that gives us such pleasure, rest, and peace, as no pictures by any other artist ever give. All this beauty of color is due to the power of refraction which light has in passing through mediums of different density, and to the power different bodies possess of reflecting and absorbing light. Some bodies absorb all the rays and we call them black ; others reflect all the rays, and we call them white ; others reflect green rays, blue rays, etc. ; we name them accordingly.

Light was considered a primary element, until Newton discovered its compound nature. A ray of solar light is composed of an indeterminate number of variously colored rays, which are distributed into groups, termed red rays, orange rays, yellow, green, blue, indigo, and violet rays. But all the rays comprised in one group are not identical in color. Some of these colors are produced by the mingling of other colors, and for simplicity, and convenience of study, we say that white is composed of yellow, red, and blue rays. These rays cannot be further divided, and as being the primary elements of light and unattainable by any mixture, they are called Primary Colors.

There are no pigments to represent the primary colors, for there is no one pigment that is free from a mixture of some other color. Thus it is difficult to get a red that is free from yellow or blue, or a blue that is without any mixture of yellow or red. The nearest approach to primary colors in paints or pigments is, for yellow, lemon-yellow ; for red, French carmine ; for blue,

ultramarine. The primary colors, mixed in varied proportions, produce hues of color. By diluting these hues with white, all tints of color are made ; by toning the hues with black, all shades of color are produced. Colors are inherent or transient. Inherent colors are material colored substances ; transient colors are those formed by the decomposition of light, such as the hues of the rainbow, the prism. The three primaries, yellow, red, and blue, in the state of transient colors, that is of the prism, rainbow, etc., when recomposed or mixed by the contrary process to that by which they have been separated, produce white light : could we get pure color in pigments, this experiment would hold good with them ; but if we mix material colors together, yellow, red, and blue, the colors are neutralized and destroyed. Any two of them, mixed in certain proportions, produce a perfect secondary, which harmonizes with the remaining primary.

To satisfy the eye and produce harmony of color, the presence of all three primaries is necessary, either in their pure state or in combination. When any one of these colors is present, the other two are called the complement of that color, or that which it requires to complete harmony. This is a physical need of the organs of sight, and we have only to be observing to prove it is so. A simple experiment, which almost every child has tried, is, to look for a time at the bright, yellow sun when low in the horizon. As we remove the eye to other objects, or shut it, we still see the image of the sun, but of a purple color, the complement of the yellow. This fleeting image is called the Ocular Spectrum. If we look upon any brightly-colored object, we may observe the same phenomena. The nerves of the eye become fatigued with looking intensely at one brilliantly colored object, and are unable to receive the rays of that color ; the other two rays, therefore, become mingled and produce the secondary, complementary color.

According to Field, colors harmonize in the proportion (that is, to the extent of surface covered) of three of yellow, five of red, and eight of blue. To produce perfect secondaries, the same proportions must be kept. Thus five of red and eight of blue make purple, which harmonizes with three of yellow, its complementary color. Eight of blue and three of yellow produce green, harmonizing with red in the proportion of five of red to eleven of green. Five of red and three of yellow make orange, which harmonizes with blue in the proportion of eight of each. These three colors, orange, purple, and green, are called secondary colors. Orange is complementary to blue, and blue to orange ; purple is the complement of yellow, and *vice versa*. The same is true of red and green, each being the complement of the other.

The mixture of the secondary colors produces the tertiaries. Thus eight of orange and eleven of green make citrine, which harmonizes with purple in proportion of nineteen of citrine to thirteen of purple. Thirteen of purple and eleven of green make olive, which harmonizes with orange in proportion of twenty-four olive to eight of orange. Eight of orange and thirteen of purple produce the tertiary russet, which harmonizes with the secondary green in the proportion of twenty-one of russet to eleven of green. Each

tertiary is composed of the three primaries, with one predominant. Thus yellow predominates in citrine, made from orange and green, each containing yellow and one other color ; red is in excess in russet, the warmest of the tertiaries ; and blue predominates in olive, which makes this color the darkest and coldest of the three tertiaries.

Colors are described as warm and cold colors : red, orange, and russet are warm, while blue, green, and olive are cold colors. Some colors are opposed to, or in contrast with other colors, as regards light and dark, advancing and retiring.

Blue is the most retiring of all colors. We see blues and blue grays in the distance in landscapes, and moving objects, as they recede to the background, lose their bright colors, and gradually assume gray tints till they vanish in the distance. It is from this retiring nature that blue and gray tints of wall-paper on a room give the room the appearance of being larger than it is ; while bright yellow or orange paper makes the walls seem closer to us, as these colors are advancing.

Yellow and purple contrast as to light and dark ; red and green do not, but they contrast as to power of color. Red is the warmest and most exciting color, and it is for this reason that bright red garments are so disagreeable to the eye on a hot summer day, and the green trees and fields so soothing and refreshing.

Successive contrast comes from removing the eye from an object upon which it has long dwelt, and seeing the image of the object dressed in its complementary colors. When the eye is then fixed upon another colored object, the color of the latter is modified with the color of this image of the eye. This is called mixed contrast. Simultaneous contrast comprises all those phenomena which take place when colors are seen simultaneously in juxtaposition. These changes arise from a property common to all colored bodies of reflecting, along with their own hue, a certain amount of the complementary rays, and of white light.

Complementary colors in juxtaposition mutually enrich each other. For example, when yellow and purple are arranged side by side, the yellow is apparently deepened in tint and enriched by the extra yellow rays given out by the proximate purple ; at the same time the purple is enlivened and lightened by its contrast with the lighter primary, and enriched in color by the extra purple rays given out by its yellow complementary. In order to attain full harmony, it is necessary that the juxtaposed colors should be of equal intensity of hue. Thus the law of harmony will be found in complementary contrasts of color with analogy of hue. When analogy of hue is wanting, that is, when a full hue of color is juxtaposed with a tint or shade of its complementary, their mutual enrichment of each other decreases in the ratio of their decrease of analogy of hue.

By juxtaposition inharmonious combinations are rendered still more inharmonious. For example, if purple and blue are placed side by side both colors are injured. A line of white between the colors diminishes the discord.

In contrasting color with a ground of white the color is enriched, the white ground overpowering the extra white rays given out by the color. In contrasting color with a black ground the color appears diluted or weakened, the extra white rays given out by the color being increased by those reflected from the black surfaces. Black grounds should not be opposed to colors which have a luminous complementary, since these must tend to diminish the brilliancy of the ground, whilst the reverse will arise from the opposition of colors which have a dark complementary. For example, blue on a black ground tends to give it a brown shade, on account of the orange complementary rays which are invariably produced by the blue, whilst orange on a black ground renders the ground more intense from the blue extra rays reflected by the orange.

Cold, negative grounds require the opposition of warm colors. Red, which in color is intermediate between light and darkness, being the contrast of gray, which holds the same place in colorless media; it also, being the most positive of colors, harmonizes agreeably with both the neutrals,—black and white.

Gray increases the brilliancy of all the primary colors when in juxtaposition with them. It may also act as a color, and form with the darker hues and shades, harmonies of analogy, while with the lighter hues and tints it may form harmonies of contrast.

Arrangements of the primary colors with black are always agreeable. Black may also be arranged with the darker hues to form harmonies of analogy, and with the luminous hues and tints to produce harmonies of contrast.

When ornamental forms of any color are placed on grounds of the complementary color they should be surrounded by a margin of a lighter or darker tint. This is required to clearly define them and to overcome the tendency the complementary colors have to become confused, from the extra rays they each give out, the effect of which is more observable where the colors come in contact. This treatment is more necessary where the colors do not contrast as to light and dark, as green and red, for they are more apt to mingle than colors of a decided contrast, as purple and yellow. When the ground is dark and the ornament of a light complementary hue, the ornament should be edged with a lighter tint. When the ornamental forms are dark, on a luminous ground of complementary color, the forms should be edged with a darker line. This is also true of self-tints, dark forms on a light ground requiring to be bordered with a still darker line.

The Oriental ornamentalists practised these laws of simultaneous contrasts, as they separated colored ornamental forms from colored grounds by borders of white, black, and gold, while on white or black grounds they used no such borders.

The primaries not only harmonize with the secondaries, and these with the tertiaries, in their state of full hues, as already described, but their tints also harmonize, and produce combinations of great beauty and refinement. For instance, lilac, which is a tint of purple, is in harmony with primrose, a tint

of yellow; and straw-color, a tint of orange, slightly neutralized, contrasts with a negative blue tint. The luminous primaries and secondaries may be used in their full hues with tints of their dark complementaries, thus: orange with pale blue, yellow with lilac, etc.; but the surface of the contrasting tint must be increased in proportion to its dilution with white. When it is desired to have a decoration of a dominant color in large masses the primaries or secondaries may be neutralized into shades, and the harmonies may be obtained by the introduction of small portions of the pure complementary. Thus, blue, lowered in tone by black, may be supported by small portions of orange, bounded by a lighter tint or white. The good colorist must study not only harmony of combination, but suitableness and local fitness, and must vary the scale of color in depth and tone for different fabrics and different purposes.

V.

HARMONY AND CONTRAST OF COLOR.

(Continued.)

WE have learned from the preceding article what the terms "harmony" and "contrast" imply, also which colors are primary, secondary, tertiary, etc., and how they harmonize and contrast. We will now consider how colors may be modified, or may appear very different from what they really are. The colors of objects are supposed to be due to a power they possess of absorbing certain portions of the colored rays that make up a ray of white light, and of reflecting other portions, the reflected portion being complementary to the portion absorbed. Thus, a red colored substance is considered to absorb blue and yellow, and reflect red. A green colored body absorbs red, and reflects blue and yellow. A white substance, then, in conformity with this view, reflects all the rays that constitute white light, while a black substance absorbs them. Bodies reflect a considerable portion of white light as well as of colored light, according as the surfaces are smooth, glossy, polished, rough, channelled, etc.; for example, pieces of silk, cotton, linen, woollen, and velvet, although dyed of exactly the same hue and tone of color, appear when viewed in the same light and at the same distance from the eye, to be of quite different colors. Both the tone and the hue of a colored object are modified by the quality of the light by which it is illuminated, whether it be direct sunlight, diffused daylight, or diffused reflected light. The form of the object also produces varieties of light and shade, and thus exhibits many tones of the same color. Color is furthermore modified in its intensity or tone by contrast of tone; for example, if a dark color be placed beside a different but lighter color, the dark color appears deeper and the light color appears lighter. The color itself may appear changed according to the circumstances under which it is viewed; red, for example, if placed in contact with blue, appears yellower; if with yellow it appears bluer; if in contact with green it appears purer and brighter; if with black it appears duller; if in contact with white it appears lighter and brighter; and if with gray, it is brightened. Thus the same red may appear many different reds, according to the circumstances under which it is viewed. If we look at two stripes, of the same color but of different tones, or at two stripes of different colors of the same tone, placed side by side, if the stripes be not too wide,

the eye perceives certain modifications, affecting both the quality and the intensity of the colors, and they will appear very different from what they do when viewed separately.

First. The tone of each stripe will appear changed, the light tone will appear lighter and the deep tone deeper, commencing at the line of contact, where it will be greatest, and gradually diminishing as it recedes from it. This is contrast of tone.

Second. The color of the different stripes will appear changed, each appearing as different as possible from the other. This is contrast of colors.

These contiguous colors are modified in hue, as if the complementary of the neighboring color was added to each. These modifications, taken together, constitute simultaneous contrast of color, which may be expressed in the following terms: Whenever the eye sees at the same time two contiguous colors, they will appear as dissimilar as possible, both in their hue and in their tone. When we look for a few moments at a given color, the eye spontaneously calls up the complementary to that color, which, being added to the color first looked at, makes it appear duller or tarnished. The effect is the same as if a quantity of gray were added to the color looked at, because the complementary color added to the original color produces black. This calling up of the secondary color by the eye constitutes the phenomenon of successive contrast; and the addition of this color so called up, to the original color, constitutes mixed contrast.

It will be seen that the result of reviving a single color is different from that produced by reviving two different colors, because the influence of the juxtaposed color is absent, — there is no complementary color to add to the color looked at. The height of tone exercises much influence upon the modification; for if, after looking at orange, we look at deep blue, this latter will appear tinged with green rather than violet, — a result the reverse of that presented by light blue. Whenever there is a great difference between two contiguous colors, the difference is rendered more apparent by bringing the same color successively in contrast with different colors belonging to the same group.

As soon as we know the complementary of one color in contact with another, it is easy to determine what kind of modification the second will receive from the first, as this modification is the result of the mixture of the complementary with the contiguous colors. The process is easy when the contiguous colors are both primaries, and it is not more difficult when they are both secondaries; for we have only to consider that, the complementary called up being much less intense than the color to which it is added, we obtain the result by subtracting from the latter secondary, a portion of that primary which, with the complementary, forms white light; thus, orange, added as a complementary to green, neutralizes a portion of the green, and consequently makes it appear yellower; and green, added to a portion of red in orange, neutralizes it, and makes the orange appear yellower. In opposing complementary colors, each enhances the value of the other, in conformity with the phenomena of successive and mixed contrasts.

The form of an object, and its gloss or polish, have a considerable influence upon the effect of associated or contiguous colors. Form exerts its influence by the effects of the light and shade it produces, which may conceal the ill effects of two associated colors which are not glossy. Thus flowers often exhibit associations of color which on plane surfaces would have a disagreeable effect if these were not glossy; as, for instance, the sweet-pea, in which red and violet are associated. Blue and violet, which do not have an agreeable effect on flat and unpolished surfaces, have a very good effect in the plumage of certain birds and in the wings of butterflies; for the injurious effect of the complementaries of these two colors upon each other is lost through the influence of the metallic lustre of the feathers and scales.

In associating complementary colors they mutually strengthen and purify each other without going out of, if they are kept within their respective scales. Therefore this association is best adapted to produce harmony of contrast in painting, tapestry, stained glass windows, and between paper-hangings and their borders, etc. In the association of non-complementary colors the result is very different; the complementary of one of the colors differing from the other color to which it is added, causes a modification of hue in the two colors, beside a modification of tone if they are not taken at the same intensity. Non-complementary colors produce three different effects when placed in contact. First, they mutually improve each other; or second, one is improved while the other is injured; and third, they mutually injure each other. The greater the difference between the colors, the more their association will be favorable to their mutual contrast, and the nearer they are alike the greater will be the risk that their association will prove injurious to their beauty. As, for example, take a case where two non-complementary colors improve each other, as yellow and blue. Being so dissimilar, their contrast is sufficiently great to produce a favorable association, although the associated colors belong to different scales of yellow and blue. Then, as an instance where one color is improved and the other is injured, take a blue, which is improved by yellow, and place it beside a bluish violet: the blue will lose beauty by becoming greenish, while the orange it adds to the violet will neutralize its excess of blue, and improve rather than injure the bluish-violet color. And as an example of the third case, where two non-complementary colors mutually injure each other, place a pure violet and a blue together, and they will mutually injure each other, because the first makes the second look green, and the second neutralizes the blue of the violet and makes it look faded. It may happen that the colors are modified, but neither gain nor lose in beauty, or that one gains without the other losing, and that one neither gains nor loses while the other loses. In the association of two colors belonging to the same scale, or to scales nearly allied but of tones very widely apart, the contrast of tone may have a favorable influence upon the beauty of the light tone, because if the latter is not a pure color, its association with the deep tone, brightening it, will purify what gray it has.

All the primary colors gain by juxtaposition with white, but the binary

arrangements which result from them are not equally agreeable ; and it is to be remarked that the depth of tone of a color has a great influence upon the effect of its conjunction with white. The binary assortments in the order of their greatest beauty, are as follows : Light blue and white, rose and white, deep yellow and white, bright green and white, violet and white, orange and white.

Black may be combined most advantageously, not only with sombre colors, to produce harmony of analogy, but also with light and brilliant colors, to produce harmony of contrast. Chinese artists make excellent use of it ; they often judiciously employ it on furniture, painting, ornaments, etc. No combination of primary colors with black is disagreeable, but there exists among them a generic difference of harmony, which is not shown, at least to nearly the same degree, in the binary combinations of white with the same colors. In fact, the brilliancy of white is so predominant that, whatever may be the difference of lightness or brilliancy observed between the various associated colors, there will always be the harmony of contrast, according to what has been said of the influence of white in raising the tone and augmenting the intensity of the color adjacent to it.

Black placed beside a color lowers its tone ; it acts as if we added black to the complementary of the contiguous color. In some cases it impoverishes it, as in the case of certain yellows. If a black pattern be placed upon a colored ground the black will appear tinged with the complementary of the ground upon which it is placed.

Gray bodies, properly selected as to intensity of tone, when contiguous to colored bodies, exhibit the phenomena of contrasts of color more strikingly than either black or white substances do. All the primary colors gain in purity and brilliancy by the proximity of gray ; but the effects are far from being similar or even analogous to those which result from the proximity of the same colors to white. White allows each color to preserve its integrity, and even heightens it by contrast, and can never be taken for a color itself, but gray can ; for the gray becomes tinged with the complementary of the adjacent color and may appear as a color itself.

Thus we see that colors undergo certain modifications, — by contact, by the shape of the surface colored, the texture, the dulness or polish of the surface covered, and by the quality of the light which illuminates it. We also see the effect of simultaneous, successive, and mixed contrasts ; and, moreover, that in associating colors the complementary arrangements are superior to all others for harmony of contrast, provided the tones are of nearly equal intensity ; and, again, that in associating non-complementary colors the result is different, — not always productive of harmony or harmonious contrast ; and, further, we have seen the effects of associating colors with white, black, or gray. Consequently, for a painter to be a perfect colorist, he must not only imitate the model by reproducing the image faithfully, with respect to the variously-colored light, but also with regard to harmony of tints in the local colors and in the colors of the different objects imitated ; and although there are colors belonging to the model which the painter cannot

change without being unfaithful to nature, yet, in every composition, there are also colors at his disposal which must be chosen so as to harmonize the rest.

In a landscape the colors are determined by the subject, yet not so arbitrarily but that we can substitute for the true color that of a neighboring scale. The artist may choose the color of the sky, imagine numerous accidental effects, introduce into his composition animals, draped figures, carriages, etc., of which the form and color may be so selected as to produce the best possible effect with the actual objects of the scene. A painter may choose a dominant color which produces on every object in his composition the same effect as if they were illuminated by a light of the same color, or as if they were seen through a colored glass. Although the law of contrast affords different methods of imparting value to a color, individual genius alone can indicate the mode in which this idea should be realized in painting.

VI.

THE APPLICATION OF PRINCIPLES OF DESIGN TO
CAST METAL OBJECTS.

IT has been said by Lord Bacon that the history of the mechanical arts is the most important branch of true philosophy; and we know that only those nations who have felt the truth of this have ever attained any proud position in the world of manufacture. The English and the French have investigated with earnestness the principles which underlie design, have sought out and endeavored to apply the rules which should govern and modify the desired union of beauty and utility, and to this fact they are indebted for the high reputation they have gained for the excellence of the work they produce. Let us rejoice that the attention of our own people is being directed to this subject, and look forward with eagerness and trustfulness to the day when America shall rank with England and France in the intrinsic value and artistic beauty of her manufactures.

One of the most important general laws established by the inquiries of others into the application of principles of design to manufactured articles, is that, namely, the basis of the design of objects executed in any material which nature offers to our use, should be a system of ornamentation strictly in harmony with the structure, both chemical and mechanical, of the finished article, with the value of the materials of which it is composed, and with an association of idea connected with them and with its purpose and probable destination.

The systems of decorative treatment of two materials, similar in some essential qualities but diverse in others, should differ in the exact ratio of those discrepancies; and from the continual observance of such natural conditions, it would seem easy to establish, in time, a system of common-sense design, within the limits of which the artist might exercise his fancy without danger of extravagance.

Thus in the manufacture of metals, any attempt at novelty, to be satisfactory to the cultivated taste, must be executed in subservience to at least a three-fold influence: firstly, to that imposed by the elementary structure of the metal, whether gold, silver, iron, or bronze; and secondly, to that deducible from all the processes of manufacture devised by human ingenuity, conducted in obedience to the peculiar properties of each metal; and, thirdly,

to that arising from emotions dependent upon a legitimate and sensible association of ideas founded upon a study of all that has been done in the best ages of the past.

In considering the application of principles of design to cast metal objects, it seems naturally to treat of them as applied to the formative process, and as applied to the decorative process. In studying the first part of our subject, we shall need to consider, 1, the character of the different metals; 2, the process of casting; 3, the principles of design deduced from a consideration of these two.

1. *The character of the different metals.* — Gold, silver, iron, and bronze are the principal metals pressed into the service of the arts. Gold and silver, from their value, ductility, and malleability, are not so well adapted for casting as for being wrought upon. Casting in silver has, however, been practised to some extent.

Bronze (a compound of copper, tin, and other alloys), from its intractability and brittleness, its excessive hardness of surface and facility of fusion, demands a completely different method of treatment. Casting and chasing appear to be best suited to its nature, and it lends itself with singular felicity to the reproduction of the highest order of sculpture. Its compact texture, shown by its peculiarly sonorous properties, dictates a system of hollow casting.

Iron is capable of being wrought in various ways: it may be cast or hammered, cut or filed. Casting is the least artistic mode of treating iron; but if iron is to be cast, the patterns formed should be so fully adapted to this method of manufacture that the mode of working may be readily apparent. Cast iron should appear as cast iron and wrought iron as wrought iron.

2. *The process of casting.* — Casting is reducing a metal to a fluid state by means of heat, and then pouring it into moulds, whose cavities it fills, and thus constitutes the counterpart of the model by which the form of these cavities has been determined. The most convenient mode of making moulds, and that now universally employed, consists in selecting materials the particles of which possess sufficient cohesion to retain their form, and which yet preserve, at the same time, sufficient openness of texture to allow of the free escape of the heated vapors and gases generated at the moment when the liquid metal comes in contact with the mould into which it is poured. Certain varieties of sand are found to best answer these requisites; but as they vary in different cases, the qualities of the sand may be considerably modified by the addition of materials possessing more or less cohesive power, such as loam, brick-dust, charcoal, plaster, etc. The simplest operation in the foundry consists in making up a bed of sand, pressing a wooden or metal pattern into it, removing the pattern, which leaves its imprint in the sand, and running liquid metal into this matrix, which, on cooling, hardens and retains the form of the pattern. In order to prevent the weight of the metal from displacing the bank of sand, it is necessary to confine the sand in a box. When only one box is employed, the upper face of the casting can only be the level assumed by the liquid metal on running into the open mould.

When, therefore, the casting requires a precise form on both sides, two such boxes must be employed, the cavities in the one being fastened over and opposite to those in the other, and an aperture being made to allow of pouring the metal in to fill up the hollow formed between them. When the form of the pattern is complex, several other boxes are added, and the whole being securely bound together, the metal fills up the cavities formed by the impression of the pattern. This is the method of *solid casting* peculiarly adapted to iron.

In a *hollow casting*, usually applied to bronze, and always used in casting statues, statuettes, and vessels and vases in most metals, the method of construction is different. After the mould has been made, a layer of clay of the prescribed thickness of the metal is laid on the inside of it, and the remainder of the space is filled up with the same material as the mould has been composed of. The mould having been taken apart, pieces of metal are inserted to keep the core in its place, and when the mould is again fitted together, a space is left which will eventually be occupied by the metal.

3. *Principles of formative design deduced from a consideration of the nature of metals and the process of casting.*—From a consideration of the nature of iron and the process of solid casting, Mr. Holtzappel gives us the following principles to be observed in designing any object intended for this material and process: “The designs for foundry patterns should always be a little taper in the parts which enter most deeply into the sand, in order to assist their removal from the sand, when their purposes will not be materially interfered with by such tapering. The sides and edges of the pattern must also be made a little out of parallel or square, perhaps as much as 1-16 to 1-8 of an inch to the foot. Sharp internal angles should be avoided, as they leave a sharp edge in the sand, which is liable to be broken down on the removal of the pattern, or to be washed down when the metal enters into the mould. Sharp internal angles are also very injudicious in respect to the strength of the castings. The designer must also make provision that the contraction of the metal while cooling shall proceed uniformly over the whole of the casting; otherwise those portions which retain their heat longest would tear away from those which had set most quickly. Iron contracts nearly one per cent of its length; brass nearly three times as much.”

The highest works of art in cast metal are statues, statuettes, and busts of-bronze. Mr. Wyatt gives us certain principles to be observed in the design of compositions intended for reproduction in this form. They give us admirable hints of the differences to be observed in designing for objects to be executed in dark-colored metals, or in light-colored substances. He says: “One important element in designing the form of a bronze statue is the background against which it is to be relieved. If this is light, as when brought against the sky, greater fulness must be given to the proportions of the limbs. If dark, as when the figure stands in a niche, a contrary proportion should be adopted, in order to restrain the lighter colored substance from appearing to swell on to its darker ground. Care should

be taken that the contour is clearly defined, not cut up, or so lost in costume that the spectator has the uncomfortable impression that the body has swollen to the dimensions of the flowing garments. Striking differences of proportion manifest themselves between figures executed in marble and those in bronze. In consequence of the dark color of bronze, every portion of the form, in order to be clearly defined, requires a certain amount of conventional treatment, so as to increase the sharpness and precision of the several forms and markings, to enable the spectator to appreciate them at that point of view from which he may likewise take in the general outlines upon which the effect of the whole figure depends. A comparison of the Greek specimens of bronze work with those of Verrochio and Donatello will illustrate the precise points of exaggeration by means of which great solidity of shadow was invariably obtained. The light being supposed in every case to descend from above, the under surface of every projection intended to throw a shadow upon a surface beneath was always hollowed upwards, and brought to a fine edge only at its extremity. Thus, the eyebrow was marked as a sharp line, and the eyes sunk, as it were, in hollow sockets, increasing the depth of the tint of shadow cast by the eyebrow by turning away from it those surfaces likely to receive the light reflected from the cheek, nose, or other adjacent illuminated portions of the head. The nostrils were likewise brought to sharp edges. The whole form of the head showed that the artist was guided in his designing by a consummate knowledge of the means necessary to compensate for and overcome the optical difficulties attaching to the material."

It should always be remembered that we are dealing with a plastic material, and may therefore employ curves and reliefs totally inappropriate to stone or marble. There are a few general and indispensable requisites for the design of a truly beautiful form for any object, and it is especially needful that these should be carefully heeded in designing for works to be executed in cast metal, on account of their possible multiplication through the medium of casting, and also of their durability.

1st. An object must be so formed as to fulfil the purpose for which it is intended. 2d. That purpose must in no way be disguised, but, on the contrary, should be apparent on the first cursory inspection. 3d. The general outline should be symmetrical, and the disposition of the various parts so proportioned as to appear strong and equal to the constructive duties they may be called on to perform. 4th. We should never imitate ornament peculiarly identified with stone or marble, in iron, bronze, or any metal; never construct in them what may be better executed in any other material; and always remember that a needless display of strength is just as weak as an appearance of deficiency, and that both excesses are to the educated eye almost equally objectionable. 5th. Lightness of effect is especially desirable in designing the form of any object in cast metal.

Mr. Pugin says regarding metal work, "In all the ancient ornamental metal-work we may discern a peculiar manner of execution, admirably suited to the material, and quite distinct from that of wood and stone. The andirons which supported either the fuel logs where wood was burned, or grates

for coal, were frequently of splendid design. The ornaments were generally heraldic, and it was not unusual to work the finer parts on iron in brass for relief of color and richness of effect. These form a striking contrast with the inconsistencies of modern grates, which are not unfrequently made to represent diminutive fronts of castellated buildings, with turrets, loop-holes, windows, and doorways, all in a space of forty inches. The fender is a sort of embattled parapet, with a lodge-gate at each end. The end of the poker is a sharp-pointed finial, and at the summit of the tongs is a saint. It is impossible to enumerate half the absurdities of modern metal workers; but all these proceed from the false notion of disguising instead of beautifying articles of utility. How many objects of ordinary use are rendered monstrous and ridiculous, simply because the artist, instead of seeking the most convenient form, and then decorating it, has embodied some extravagance to conceal the real purpose for which the article has been made. Neither relative scale, form, purpose, nor unity of style is ever considered by those who design these abominations."

From this we see how necessary it is that all these considerations, relative scale, form, purpose, and unity of style, should be ever in the mind of the designer. Indeed, it seems as if he, of all men in the world, needs a large amount of downright common-sense. With this possession he cannot perpetrate absurdities, but must make something good and worthy of his art.

But a few words need be said concerning the second part of our subject,—Design applied to the surface decoration of cast-metal objects. Mr. John Bell says that "the superior strength and compactness of metals over other materials afford the opportunities also for superior fineness of parts in ornamentation. Those piercings and cuttings which would be inconsistent with firmness in wood or porcelain are yet durable in metal." While the form of the object should always be most carefully adapted to use, being studied for elegance and beauty of line as well as for capacity, strength, mobility, etc., care should be taken in ornamenting the construction, to preserve the general form, and to keep the decoration subservient to it by low relief or otherwise. The ornament should be so arranged as to enhance by its lines the symmetry of the original form and assist its constructive strength. If arabesques or figures in the round are used they should arise out of the ornamental and constructive forms, and not be merely applied.

The amount of ornament should always be proportioned to the purpose of the object and the condition of its probable proprietor. There should be no direct imitation of nature, and yet no perversion of her forms. It would be well if a system of judicious contrast of plane surfaces and enrichment were carried throughout such works, and each ornament applied only to those points where the general form appears to demand accentuation. It must ever be remembered that repose is required to give value to ornament, which in itself is secondary and not principal.

VII.

DESIGN AS APPLIED TO WROUGHT METAL.

THERE is the same difference between an object in wrought metal and one in cast metal as there is between an original work in clay and its reproduction in plaster of Paris. Both the wrought metal and the clay give you the thought and touch of the artisan or artist, while the cast iron and the plaster cast are but mechanical and cheap reproductions. It must be obvious that for trade purposes, in which the element of cost is important, that which is capable of being produced at the cheapest rate will have a high degree of popularity; and in the lower or subordinate features of decoration, in which sameness or repetition must of necessity be practised, the use of material in a liquid state — either molten, as in metal, or mixed, as in plaster, or impressionable and soft, as in clay — is a matter of convenience, because of its readiness to assume any form desirable for it to take.

The worker in metal who desires to elaborate an original idea in wrought iron is one of the noblest of art-workmen. His work involves forethought, strength, and skill: forethought to conceive the idea, strength and skill of hand to express it. Every element of creative ingenuity is here called into play, will, power, and experience are to achieve a victory over the half-melted iron harder to achieve than many won on the battle-field, because it will be a victory gained over the sturdy and unyielding material of one of the hardest of substances; but there is a hope in the workman that just as the strong arm compels and shapes the unwilling material, so the impress of his thought will be fresh, having the virtue, in this imitative age, of being like itself and not a mere echo of another's thought. It will have neither the vulgarity of manufactured forms turned out by the hundred nor the unimportance of details which must be reckoned by the thousand to have any effect at all. The smith with his anvil and hammer has always been a symbol of honorable industry from the most ancient times, and in some of the best art-epochs hand-workers in metal have been numbered as artists. This is to be accounted for by that which has already been described; yet the artist is pre-eminently one who makes original work, whether in metal, stone, or on canvas. It is said that the character of true art-work is shown in its details, and some of the most thorough and beautiful modern industrial art-work is to be found in the wrought-metal screens, gates, candelabra, and other details of revived Gothic architecture.

Wrought-iron work, terra-cotta, encaustictile work, embroidery, and stained glass stand forth amongst the shams and make-believes of many branches of modern industrial art, like a company of honest men in a community of thieves and impostors,—and I say this because all good art, fine or industrial, must have the impress of some originality and actual purpose. To do work that is simply easy because it can be accomplished without thought or labor, or because it meets the frivolous demands of a fashion that is constantly changing, is to employ the serious labors of a life in obedience to the demand of a trifling and unconscientious master. Anything which can infuse into the works of our hands a seriousness which will make us feel responsible, not only to ourselves but to the whole society in which we live and the race of which we are members, is an advantage to all, and any branch of art which involves the labor of the strong arm, the exercise of the determined will, and the employment of forethought and skill, is equally advantageous in the world of art and industry. To understand the principles of design as applied to wrought metal in contradistinction to that which would be applicable to castings, we must define the difference between the two. In cast work the original design has first to be made in another material, such as clay or wood. A mould in sand is taken from this original, and the metal in a liquid state poured into the mould. When the metal is cool the mould is removed, leaving the cast-metal work in a rough state, to be finished by hand labor, if in silver, gold, or bronze. This process in the precious metals is called chasing, and, together with the sister art of embossing, is really wrought-metal work of a refined and artistic character. Thus the cups and shields of Cellini or Flaxman were first modelled in clay, cast into plaster, recast into silver, and finally finished or chased in the precious metal itself. The limitations involved in this kind of work make it appropriate only to subjects in low-relief, in which there are no under cuttings, as there must be in figures highly relieved from their background; and many of the most beautiful masterpieces of artistic metal-workers have been worked up from outlines, with the added roundness suggested by good perspective. Such work is a compromise between cast and wrought metal work, having some of the characteristics of both. Perhaps the most complete example that can be given of cast metal work is an ornamental railing which is cast in lengths, each forming a detail complete in itself, and requiring no finishing by the hand; whilst an equally good instance of wrought-metal work would be a scroll of stem and foliage hammered out from a single bar of iron upon the anvil; some of its more exuberant details being separately wrought and bolted to the main stem by rivets. It must be evident from this that the forms which can be worked out in wrought metal must depend for their effect principally upon the purity and refinement of their outlines rather than upon the delicate variations of their surfaces. What is to be done in the material which is to be wrought, must be done whilst it is hot, and therefore in a soft state, for as it cools it becomes harder and therefore more difficult to work. A great advantage of working in iron is the lightness and delicacy which are possible in so strong a material; for it should

be remembered that every stroke of the hammer increases the tenacity and durability of the metal. A design which would appear weak and flimsy in cast iron, because of the friable nature of the metal when cast, would appear strong and graceful in wrought work, from the hardened, fibrous nature of the hammered metal. Projections or isolated portions, liable to fracture upon a comparatively slight touch if cast, are strong and durable if hammered upon the anvil. These considerations must necessarily determine the character of wrought-iron work. The capacity for artistic effect is so much greater when the relief or direction of the parts may be anything we like to make them, than when it is limited by the comparative weakness of the material, that designs for wrought iron should never resemble designs for cast iron. It should not be entirely forgotten that in some instances, where great strength is required, such as in columns or pillars which are to bear great weight, cast iron is said to be stronger than wrought, on account of its resistance to compression. Thus wrought iron will bend without breaking: cast iron cannot bend without being fractured; so that when a cross-strain or compression may be possible cast metal is preferable to wrought. What concerns us, however, in considering the question of design applied to this material, is the character of the ornament which may be applied to it rather than the value of the metal as a building material.

While speaking generally of wrought iron, we must not forget that brass also is often wrought. In bygone times even lead and pewter were both used as materials for ornamental works in metal. In modern days, however, the two great materials for wrought work are iron and brass. Brass, as being the softer of the two, is more extensively used for ecclesiastical metal work, candelabra, screens, hinges, and all work where elaborate ornament is in place. Let us see how works in wrought metal may be used consistently, having due regard to their constructive value as well as to their ornamental effect. The weaker materials employed in the constructive arts require to be strengthened by the strong materials; and here comes in the skill of the architect or the ingenuity of the engineer. In details, however, the ornamentist is employed; and though in its grandest and most comprehensive use, the engineer perhaps may shape the lines of a bridge or an ocean steamer, in a manner that will unite both the strength and the beauty which metal can be made to assume, or the architect may so use this noble material that it may be the ultimate expression of graceful and accomplished service, it yet belongs to the ornamentist to express in the most complete manner the artistic capabilities of a material which is both strong and beautiful. Wrought metal may be used entirely by itself, being both constructive and ornamental, as in the case of ornamental gates, whether for domestic or ecclesiastical purposes, or it may be used in combination with other materials, such as wood or stone. In wood it may be used to form the hinges of doors or cabinets, or the handles for the same. In stone it may form the connection between different slabs, or serve as a shield or protection for the more delicate parts. Occasionally stone is protected by iron, as before the west front of Antwerp Cathedral, where a public well is covered by a delicate

network of wrought-iron tracery, said to have been the work of Quentin Matsys, a mechanic who subsequently developed into a fine artist, in more senses than one. It may not be irrelevant, both for artistic and social purposes, to tell his story: "Quentin Matsys was a worker in iron at Antwerp in the 15th century. He was what would be called in these days a blacksmith, because he wrought in a dull colored metal, in contradistinction to a whitesmith, who works in lighter colored material of the same nature. At the age of twenty he was already a lover of the beautiful, and being so, could hardly help falling in love with the most charming object within the range of his daily vision. That object was the daughter of a painter at Antwerp, who was not averse to being wooed, but could only be won by a painter like her father. It has been said that the strongest of all feelings is the love that a young man feels for a young woman; and we have the authority of the most conscientious of historians for saying that this love which Quentin Matsys felt, actually turned his anvil into a canvas, and his hammers and files into brushes and pigments. He saw that this wayward maiden's affections could only be gained through the medium of fine art, and that in her view the industrial art of a blacksmith was not of this character. Down went the hammer, and the anvil gave forth no more musical sounds. The artisan forsook his noisy workshop and commenced a new apprenticeship to fine art, at which he labored until success shone upon him; and when his first triumph as an artist was displayed to the approving gaze of the maiden's father, the transformed blacksmith could exclaim like young Lochinvar, "She is won! They'll have fleet steeds that follow."

This mediæval example is not without parallel in later days. Some of the very best modern artists began their experience in the workshop, and before we can assume to lead and improve public taste in the higher branches of art we ought to demonstrate to the world that we comprehend its necessities as well as its enjoyments.

The principles of good design apply to this as to all industrial efforts, and in the general statement of these principles the application of skill to working in iron is directed in common with other processes. The same general laws which should guide the ornamentist in one branch of industrial art, should, recognizing the difference of material employed, direct him in all. At the same time, though fitness, adaptation to purpose, and beauty should be alike characteristic of all branches of industrial art, there must be controlling circumstances, in each, which will decide, not only the amount, but the character of the ornamentation employed.

Skill in design and arrangement having been acquired, its proper application to special departments of industry will depend upon a knowledge of special requirements, the nature of materials, and the capabilities of manufacture, all of which knowledge can be readily mastered by those who have already overcome the greater difficulty of learning to design.

The highest authority yet recognized in England on the general subject of industrial design, is Richard Redgrave, R. A., Inspector General for Art of the British Government. The work which won for him this high reputation,

was a report on design as represented at the Great International Exhibition held in London in the year 1851. From this work is quoted the following, relating to general principles in design : —

“ The ornament of past ages was chiefly the offspring of handicraft labor : that of the present age is of the engine and the machine. This great difference in the mode of production causes a like difference in the results. In the old times the artist was at once designer, ornamentist, and craftsman, and to him was indifferent the use of the pencil or the brush, of the hammer, the chisel, or the punch. His hand and his mind wrought together, not only in the design but in every stage of its completion, and thus there entered a portion of that mind into every minute detail and into every stage of finish ; and many a beautiful afterthought was embodied by the hand of the ‘ cunning artificer,’ many a grace added to the work by his mastery and skill. He worked, not to produce a rigid sameness, but as Nature works, she produces nothing exactly similar to its fellow ; in every turn of every stage of growth, in every flower and in every leaf, adding a changing grace, a differing beauty. So he varies his labors with every feeling of his overflowing mind. But this is not possible with the stamp, the mould, the press, and the die, the ornamental agents of our days : after the type or mould is made, all the products are rigidly the same, whence arises a sickening monotony, a tiresome sameness, unknown in the works of nature and peculiar to these artificial works of man ; the varying mind has no share in their production, and man himself becomes only the servant of the machine. Moreover, the old ornamentist worked generally from feelings of piety, from love of his labors, or from the desire of fame,—motives hardly known to the artist of this class in our days, at least in this country. Who seeks fame from the ephemera of a season ? Who loves a labor that is so soon to pass away ? Who cares for a work that is not to be the child of his own hand, but to be produced in thousands by the aid of machinery ? The toil of him of old times was spent upon the thing itself and not upon a mere model for it ; the chalice, the cup, the lock and key, the reliquary, were to be without repetition and without rivals ; he sought to give them their highest excellence, and, laboring from one of the feelings we have described, threw his whole soul into his work, so that it became a thing for future ages to look upon and to prize.

“ Not that handicraft or art-workmanship is utterly excluded from our manufactures ; it is only partially so, making more painfully evident how greatly ornamental art has suffered from its new union with machinery. Wherever ornament is wholly effected by machinery, it is certainly the most degraded in style and execution ; and the best workmanship and the best taste are to be found in those manufactures and fabrics wherein handicraft is entirely or partially the means of producing the ornament, as in china and glass, in works in the precious metals, carving, etc. This partly arises from the facilities which machinery gives to the manufacturer, enabling him to produce the florid and overloaded as cheaply as the simple forms, and thus to satisfy the large market for the multitude, who desire quantity rather than quality, and value a thing the more the more it is ornamented. This state of modern

manufacture, whereby ornament is multiplied without limit from a given model, by the machine or the mould, ought at least to awaken in the manufacturer a sense of the importance of the first design. One would think that what was to be produced by thousands and tens of thousands should at least be a work of beauty, and no pains be spared to ensure its excellence. The cost of the first design or model must in such a case be a mere atom when divided among its myriad prototypes. It would seem strange, too, that any one could be found to throw away great expense upon dies and moulds, to carry out a design which in itself was hardly thought worth paying for. Yet often in this country artists are paid little better than workmen, and a belief seems to prevail that knowledge, skill, and taste come by nature. The artist has often no interest in the result of his labors, his name is unknown, his pay is niggardly, and what there may be of beauty and excellence in his work is often spoiled by the alterations of the manufacturer, who makes no scruple of setting his own taste above that of the artist, and altering and changing a design at his sole pleasure. In France, and some parts of Germany, where taste has long been cultivated and the value of ornamental design is better understood, these relations are better understood also; and in this country, if good taste is to prevail, the manufacturer must learn to appreciate more highly the value of the designer's labors, and must seek to foster his talents and stimulate his *amour propre*.

"Such works in iron as gates, balconies, and panels are, for the greater part, in cast metal, which, of late years, from its capability of cheap ornamentation, has almost wholly superseded wrought iron for these purposes. When the object is intended to be fixed and immovable, as a balcony or panel, cast work is not unsuitable, and is capable of much beauty of ornamental design. The ornament may add to the strength by its numerous articulations, while it is light and elegant in its forms. Works of this kind are generally of a size to admit of casting in one piece, ensuring thereby strength and lightness by continuity of parts. But in cast iron constructions intended to be movable, as in the various kinds of gates, a very different character of design is necessary; in the first place, because entire casting is not always possible, both from the difficulty of running the metal into the numerous ramifications of the ornament in works of such increased size, and from the fear of warping in the cooling, as well as the great expense of a mould, which is saved by forming the ornament of a series of parts. This leads to the necessity of framing the work in wrought, and applying the ornamental details in cast iron; but hence results this evil, — that the ornament has little constructive use, and is apt to look rather an addition than an integral part of the work. In the park-gates exhibited, great pains have been taken to get over this difficulty, but not with success, since the two metals are joined in parts wholly at variance with constructive strength; in fact, it is a wrought-iron design, partly executed in cast metal. Moreover, cast-iron ornament is necessarily far heavier than that of wrought iron, from the extreme brittleness of the cast metal. This heaviness is sadly opposed to its real constructive strength in the manner usually adopted for putting together, the ornamental parts of such structures being

riveted or screwed into the framing. There are smaller points of attachment than in wrought iron; the parts bed themselves less perfectly at the junction, since it is impossible to assist this union with the hammer, and the metal has small tenacity, and easily breaks with any sudden jar; thus there is much less power to support, while there is of necessity much greater weight to bear, and without very careful and well-considered design, making the ornament as far as possible a brace to the work, the whole is apt to be an insecure aggregation of parts, without constructive unity or truth. In large works, cast in one piece, such difficulties are readily surmounted, as weight can then be made to add strength, instead of detracting from it. In the old hammer-wrought gates, the ornament was not only a truly integral part of the work, but most materially assisted in the general support. Thus great lightness and elegance were, in this case, consistent with great strength, since the ornamental details supplied a means, not only of tying and bracing the work together, but of preventing the front of the gate from drooping with its own weight, to the great hinderance of its use, and which in cast works of this kind has often to be assisted by the use of friction rollers, — a make-shift that the older workmen would have despised. When, therefore, we consider the varied beauty of which wrought iron is capable, its far greater durability, its tenacity and power of resisting accidents, the individuality of design which arises from its being wrought by the hand instead of cast in a mould (thereby leaving the fancy and the feeling of the workman untrammelled), it seems not too much to say that it is to be hoped the use of the wrought metal will again prevail over that of cast for such purposes."

From Scott's "Half-Hour Lectures on Art" the following extracts are selected:—

"Iron, as has been already remarked, is by far the most important of the metals, and is also the most difficult to procure and prepare. The armor of the ancients was brazen, and the weapons of the common soldiers also, down to a comparatively late date, before our era. Whether Homer was acquainted with iron at all is a question among his commentators, although Hesiod, about the same time, along with the Golden, Silver, and Brazen, mentions the Iron Age. Whether iron was worked in Britain at the Roman conquest of the island is also doubtful, although Cæsar says rings of iron were circulated as money. If so, they might have come in exchange in commerce; rings of gold used for a similar purpose were certainly in circulation. Of what metal the swords or scythes were made with which the axles of the native chariots were armed does not appear. But it is quite certain our iron works were in active operation immediately after the Roman settlement, as Roman coins and pieces of Samian ware have been found under, and mixed with, the cinder-heaps or accumulations of scoria in the forest of Dean in Sussex, and in the neighborhood of Bradford, Wilts. Hadrian entered Britain 120, and Scrivenor, in his history of the iron trade, supposes it probable that the *fabrica* or great military forge was established at Bath in the following year. Manufactories of arms had been then lately introduced as part of the Roman system, and must have been found highly advantageous, as they were planted in such parts of subju-

gated provinces as presented abundance of iron. These *fabrica* were organized colonies or colleges of armorers. The armor-smiths working in these factories were formed into companies, each governed by a head, the business of these companies being to make arms for the legion to which they were attached. The arms so made, when not required for distribution, were piled up in adjacent arsenals. Each armorer had a stipend settled upon him, and was not allowed to leave the colony, having a stigma or mark burned into his arm on becoming a member of the *fabrica*. Nothing escaped the quick sight of these civilized invaders; and although, after four centuries of rule, the Romans left Britain little the better for their refinements, while in possession they appear to have been actively employed in many arts connected with metals. Coining was carried on in several places: they tried for gold, by breaking up the quartz now lying in enormous mounds near Lampeter; silver they also found; and pigs of lead, stamped with Roman names, have frequently been recovered in Derbyshire and elsewhere.

"The first distinct mention of native iron works is in the Domesday Book. In this record the city of Gloucester was required to pay royal tribute in the shape of iron, — thirty-six dicars of iron, ten bars to a dicar, and one hundred iron rods for nails or bolts. Shortly afterwards iron and steel began to be imported from Germany and other countries. The German merchants of the steel-yard, of whom we now hear, are thought to have been traders in these metals, dealing at a place so called. The defensive armor of the period, made in various parts of Europe, was constructed of fine steel rings, woven together to fit the body closely, and admirably tempered, the helmets being caps of polished plate, to the edge of which ring-mail for the neck was attached. In the public records of England, which contain an infinity of curious matter, we find some notices of iron worth extracting. In the thirteenth year of Edward II, the Sheriff of Surrey and Sussex is ordered to provide horse shoes and nails for the expedition against the Scots. A little later, in 1327, we hear of cannon, supposed to have been then first used in that country by Edward III in his invasion of Scotland. These were made of banded iron till the invention of gun metal much improved the weapon, about the middle of the fifteenth century. Still importation increased, not only of the material, but of manufactured articles of all sorts, and an Act of Parliament was at last procured by the hammer-men of London and other towns, in 1483, prohibiting the importation of many articles of iron-work.

"The abandonment of beaten iron as a material for the treatment of the designer is much to be regretted, its strength and elastic character fitting it so well for tracery and foliage, and qualifying it for taking an expression at the hand of the artist which no other material can supply.

"The stroke of the hammer has infinitely more expression than any cast from a mould, even were the molten metal much more ductile and better fitted for sharp castings than we ever find it."

My last extracts are from Dresser's "Principles of Decorative Design."

"There are various modes of working metal. It may be cast, hammered, cut, engraved, and manipulated in various ways. Little that is satisfactory

can result from casting. Casting is a rough means of producing a result, and at best achieves the formation of a mass which may be less troublesome to cut into shape than a more solid piece of metal; but casting without the application of other means of working metal achieves little of an art nature.

Let us take a sugar-basin. What form should it have? The handles are often so small as to be partially or wholly useless; it not unfrequently happens that only one or two fingers can rest on the handle, owing to its smallness, while the thumb has to be placed within the orifice of the basin when it is desired to move it. This should not be so: if a handle is to exist at all it should be so formed as to be useful and afford a means of moving the object with ease and comfort. To form a handle as a mere ornament is an absurdity; for the handle is part of the vessel structurally, while the ornamentation is an after and separate consideration. In order to its existence a vessel must be constructed, but when formed it need not of necessity be ornamented; ornamentation must ever be regarded as separate from construction.

Damascene work is of great interest. Metal of one color is inlaid into metal of another color. India produces, perhaps, the rarest examples of this kind of work, the Indians being experts at this kind of manufacture; but the Indian work consists chiefly of silver inlaid in iron. This mode of work seems to be capable of producing many beautiful effects, as all who have examined the large inlaid *hookahs* of India will admit.

Having chosen a form for a vessel, the next question with which we have to deal is, Will it require a handle and spout? It is curious that while the position of a spout and handle in relation to a vessel is governed by a simple natural law, we yet rarely find them placed as they should be. This is the more curious as a vessel may become practically of great weight, owing to the handle being misplaced. A pound weight is easily lifted, but when applied to the longer end of the steel-yard it will balance a hundred weight. If this principle is applied to a tea-pot, which actually weighs but little, it may yet be very heavy to lift. In nineteen cases out of twenty, handles are so placed on tea-pots and similar vessels that they are, in use, lifted only by a force capable of raising two or three such vessels, if the principle of the steel-yard was not acting against the person who uses the vessel.

The object of art is the giving of pleasure; the mission of the artist is that of giving ennobling pleasure. If, as an artist, I give pleasure, I, to an extent, fulfil my mission; but I do so perfectly only when I give the greatest amount of the most refined pleasure by my art that it is possible for me to give. If, by producing works that can be procured by many, I give pleasure, it is well that I do so; but if the many fail to derive pleasure from my works, then I must address myself to the few, and be content with my lesser mission. Education appears to be necessary to the appreciation of all art: the artist, then, is a man who appeals to the educated.

Utility and beauty are not inseparable; if an article of any kind is intended to answer any particular end, it should be fitted to answer the end proposed by its formation; but after it is created, as a work of utility, care must be exercised in order that it be also a work of beauty. With due con-

sideration, almost every work may be rendered both useful and beautiful, and it must ever be the aim of the intelligent ornamentist to render them so.

Casting is the least artistic mode of treating iron; but if iron is to be cast, the patterns formed should be so fully adapted to this method of manufacture that the mode of working may be readily apparent. It is foolish to make cast iron appear as wrought iron. Cast iron should appear as cast iron, and wrought iron as wrought iron. Cast iron is brittle, and must not be relied upon as of great strength; while wrought iron is tough, and will bend under great pressure rather than break. Wrought iron can be readily bent into scrolls, or the end of a rod of metal can be hammered flat and shaped into the form of a leaf, and parts can be welded together or fastened by small collars, pins, or screws.

In iron work the manifestation of a true constructive principle is beyond all things desirable. Iron, being a strong material, should not be formed into heavy masses unless immense weight has to be sustained, or very great strength is required. If we form lamps, candelabra, and such works of iron, it is obvious that the portions of metal employed in the construction must be thin, as the material is of great strength. Were we to form such works of wood, then a greatly increased thickness of material would be necessary in order that the same strength be secured, as wood is not nearly so strong as iron.

Notice the ease with which iron may be treated if a correct mode of working be employed. Let a bar of iron be taken which is about half an inch in thickness by one and a quarter broad. This can be rolled into a volute, or its end can be hammered out into stems and leaves, and to it can be attached other leaves by rivets, screws, or ties, or it can be bent into any structural form. Let the student study the shapes into which simple bars of iron can be beaten — both mentally, and by observing well-formed works.

Brass, copper, and other metals may be associated with iron in the formation of any works. If well managed, brass and other bright metals may act as gems, that is, they may give bright spots; but where the bright metals are used with this view, care must be exercised in order that the bright spots be formed by beautiful parts, and that their distribution be just, for that which is bright will attract first attention."

Having the example of the best men in past days to guide us, let us endeavor to prove that Art is as capable of beautifying daily life as she is competent to excite the most pious and patriotic aspirations. Let us strive to show that underlying the highest requirements of life there is first a necessity or service, and that without it the mere affectation of service, even if rendered in the most ornamental manner, is a delusion and a snare. For this reason, work in wrought metal, from its capacity of service in the first place, and its capability of refined art expression in the second, is a thing which should have our respect and love. It is capable of being in the highest degree serviceable and in the most exalted degree beautiful; and therefore we should regard this art of the hand-worker in wrought metal as one of the means by which the love of art, and the industrial use of art, which together make up the highest ideal of industrial art, can be expressed.

VIII.

DESIGN APPLIED TO CARVED OBJECTS.

"DESIGN," says Redgrave, "has reference to the construction of any work both for use and beauty, and therefore includes its ornamentation also. Ornament is merely the decoration of a thing constructed."

The first aim of the designer of any article must be to render it useful. It must be made not only useful, but as perfectly suited to the purpose for which it is intended as it can be. It matters not how beautiful the object is intended to be, it must first be formed as though it were a mere work of utility; and after it has been carefully made with this end in view, it may then be rendered as beautiful as possible; for an object may be beautiful, and yet useful.

The art of carving in wood is of ancient date. Nuremberg was celebrated for its wood-carvings centuries ago, and this kind of decoration was long since used for adorning the altars in German and Belgian churches.

The different processes of carving in wood are interesting, as affording an idea of the different designs employed.

Carvings may be of two kinds, either in what is called low-relief, being rather flat, or only slightly raised; or high-relief, where the figures are made to stand out more boldly from the background. The tools for wood-carving are very few,—a mallet, one or two chisels (one of them known as the V chisel, from the shape of its sharp-pointed blade), several gouges of different sizes, files, etc. etc. The outline of the design may be drawn upon the wood for carving in low-relief, and a shaded drawing also may be used as a guide. The designs for large pieces of carving are often made on a small scale, and then enlarged by the workman that he may have a full-sized drawing to work from. First, the whole is blocked out by cutting around the prominent figures, and then, following the lights and shadows in the drawing, which represent the different kinds of relief, they are rounded into shape. This is far less difficult than carving designs in high-relief, in which case a much thicker block of wood is required, as many of the forms which are flat in the drawing may be, in the carved work, in a plane oblique to the ground-work, or even at right angles with it. For example, suppose it is desired to carve a flower which is seen in profile. The carver cuts into the solid block with the chisel and mallet in the vicinity of the flower, leaving a hole, the size

of which varies according to the object to be carved. Then, on one of the sides of this cavity in the wood, he marks the outlines of the flower in pencil, and proceeds to carve it; but it is evident that the workman has much judgment and taste if he successfully catches the spirit of the design, and expresses it upon the wood. Sometimes, where it is essential that a form should be exactly reproduced, as of a face or head, a model in plaster is given him, and in machine carving this model is indispensable.

I propose to give a little sketch of this method of carving; for though the best and most finished work is not done in this way, it is useful in reproducing different forms in a rapid manner. A copy of any — even an elaborate — work may be made by means of machinery, though the ornament will lack that smoothness of surface and delicacy of finish characteristic of good works. Machinery will do for the sculptor and carver what engraving has done for the painter. The machine for wood-carving consists of two parts. The first or horizontal part is the bed-plate and floating-table, on which the blocks of wood to receive the carving and the copy are placed; the second or vertical part of the machine is that which carries the tracing and cutting tools, the only motion of which, except the revolution of the cutters, is vertical. The object to be copied is placed between two blocks of wood; the tracer is placed over the object, and the cutters over the blocks of wood. These three — the tracer and cutters being fastened to an unyielding bar — obey exactly the same vertical motion: as the tracer is raised or depressed in passing over the model, so are the cutters lifted from or sunk into the wood. There is a treadle below the table which is managed by the workman's foot, and by it he is enabled to raise or depress the cutter. Thus any design, however elaborate, if modeled in clay, may be executed in wood by machinery. But machine-carving is often faulty in design and inappropriately used, and plain wood, without decoration, is in far better taste than most of the styles of machine-carving used at the present day.

Wood-carving admits of minute elaboration; and yet there may be an excess of finish in works of carving connected with cabinet work; for if the finish is too delicate, there is a lack of effect in the result. A piece of furniture is not a miniature-work, which is to be investigated in every detail. It is an object of utility, which is to appear beautiful in a room, and is not to command undivided attention.

Dresser says, "Carving should be sparingly used, and is best confined to mouldings, or projecting or terminal ends. If employed in mouldings, those members should be enriched which are more or less completely guarded from dust and injury by some overhanging member. If more carving is used, it should certainly be a mere enrichment of necessary structure." He says further, "I am not fond of carved panels; but should these be employed, the carving should never project beyond the styles surrounding them, and in all cases of carving, no pointed members must protrude so as to injure the person or destroy the dress of those who use the piece of furniture. If carving is used sparingly, it gives us the impression that it is valuable; if it is lavishly employed, it appears to be comparatively worthless.

The aim of art is the production of repose. A large work of furniture which is carved all over cannot produce the necessary sense of repose, and is, therefore, objectionable."

Wood-carving is appropriate for cabinets, coffers, sideboards, and other repositories of household goods; but it should be sparingly used upon chairs, tables, couches, and in all situations where a knotted lump of wood is likely to prove uncomfortable to the touch. Ancient decorative carving is far superior to modern work of the same sort, being sometimes rude, but possessing much strength and beauty.

It is oftentimes considered by some of the so-called best designers that the best proof of good carving is its exact imitation of nature; but it is no less true for carved work as for other decorative work, that natural objects employed in a design should be conventionalized, though the foliage employed in Gothic architecture in the decoration of the capital is carried around the bell in something of a wreath-like form, and often exhibits much of natural freedom. The oak, the ivy, the hazel, the vine, the fern, etc., are frequently very beautifully and closely copied from nature.

Wood-carving, applied as a means of decoration to doors of cabinets and other similar places, should be treated after a thoroughly abstract fashion. Table-frames are sometimes decorated with a delicate bas-relief of ornament, which is very pleasing.

The character, situation, and extent of ornament should always depend on the nature of the material employed as well as the use of the article itself. Mouldings were originally employed to decorate surfaces of wood or stone, which sloped either vertically or horizontally from one plane to another. Thus, the mouldings of a door represent the bevelled or chamfered edge of the stout frame-work which holds the slighter panels. It is obvious, therefore, that these mouldings ought to be worked in the solid wood, and form a part of the frame-work referred to, and they should not be allowed to project beyond the surface of the door-frame. The same is true of the cornice which crowns the book-case.

The best and most picturesque furniture of all ages has been simple in general form, though often enriched with elaborate carved work. Old frames for mirrors, made in the last and previous centuries, were moulded and carved out of solid wood. In former days, when wood was cheaper than it is now, oak-panels were commonly used, not only in the halls and passages, but in many rooms of even a small-sized London house. The judicious association of the "bead fillet and hollow" for mouldings was a simple, honest, and frequently effective mode of decoration.

In connection with this subject, much might be said about architecture, the decoration of stone columns, etc. In Egyptian architecture the columns of the temples are of a very ornamental character, and in most cases were formed of a bundle of papyrus stems, bound together by thongs or straps, the heads of the plant forming the capital of the column and the stems the shaft. In some cases the lotus was substituted for the papyrus, and in other instances the palm-leaf was used in a similar way.

We have here an opportunity of noticing how the mode of building, however simple or primitive in character, first employed by a nation, may become embodied in its ultimate architecture; for undoubtedly the rude houses first erected in Egypt were formed largely of bundles of the papyrus, which were gathered from the river-side, as wood was rare in Egypt; and ultimately, when buildings were formed of stone, an attempt was made to imitate in the new material the form which the old reeds presented. But, mark, the imitation was no gross copy of the original work, but a well-considered and perfectly-idealized work, in which the bundle of reeds received true architectural qualities.

In one respect the Greeks resembled the Egyptians, for they rarely created new forms. When once a form became sacred to the Egyptians it could not be altered: but with the Greeks, while bound by no such law, the love of old forms was great; yet the Greeks did not seek simply to reproduce what they had before created, but labored hard to improve and refine what they had before done; and even through succeeding centuries they worked at the refinement of simple forms and ornamental compositions, which have become characteristic of them as a people.

In treating of design it is difficult to separate ornament from architecture. The material at command, the religion of the people, and the climate have, to a great extent, determined the character of the architecture of all ages and nations; but they have, to the same extent, determined the nature of the ornamentation of the edifices raised. Ornament always has sprung from architecture, or been a mere reflex of the art-principles of the building decorated. We cannot rightly consider ornament without architecture. Decoration should be in accordance with the traditional development of original and necessary forms.

In reference to sculpture, the following quotations from Mrs. Jameson may not be inappropriate:—

“The word sculpture (from *sculpo*, to carve) signifies whatever is cut or carved into shape. We apply the word, technically, to all the productions of the plastic or formative arts; that is to say, to all imitations of natural forms fashioned out of any solid material, whether they be modelled in clay or wax, cast in metal or gypsum, carved in wood or ivory, hewn in stone or metal.

“As we distinguish the productions of sculpture, considered as one of the fine arts, under two divisions, in the first we comprise all insulated, complete figures, single or grouped. These we call, in a general way, statues; they may be standing, seated, or recumbent. In the second division we place all figures which are partly raised on a flat plane, which we style, in a general way, bas-reliefs.

“But when we would describe accurately we distinguish between—I. *Basso-Relievo*, bas-relief or low relief, where the figures are slightly projected. II. *Mezzo-Relievo*, half relief, where half the figure appears as if sunk in the block, and half above it. III. *Alto-Relievo*, plain relief, high relief, where the figure is almost detached from the plane behind, standing out from it, though still not wholly detached from it.

"In the mediæval sculpture, and the modern imitations of it, we find a mixed style, in which all the three degrees of relief are used, the figures in the background being in very flat relief, those in the middle-ground in half relief, and those immediately in front in high relief.

"One of the first considerations of sculpture is the material. We should observe that the management and capabilities of different substances are considerations of great importance; that figures which look well in one material do not look well in another; that metal requires a different treatment from marble, and is fitted for purposes where marble would be misplaced. Size is another of the external conditions of sculpture which must be well considered. Many subjects which are extremely graceful and ornamental, of small size, become repulsive when enlarged. When a figure is rather above nature we style it 'heroic'; when much above the natural height it is 'colossal.' If a statue be half the size of life, or less, it is called a statuette. Some of the antique colossal statues may be diminished into statuettes, retaining their grace and even their sublimity; but a subject originally conceived of a small size can seldom be enlarged to colossal dimensions.

"The locality for which a statue is intended is also of great importance, — whether for a church, a temple, a hall, a gallery, a room, or a garden; whether for a high or a low situation. A statue which is to be placed in the open air, or to enter into an architectural composition, or to form part of a sacred monument or an historical memorial, requires a different treatment from one which is to decorate a room in a palace. A central situation in a large space requires that the figure and attitude should display beauties in every point of view. The management of bas-relief requires great skill, that neither the figures be too numerous nor the lights too multiplied and broken, for then we lose distinctness. Simplicity, therefore, is one of the necessary conditions of a fine bas-relief.

"Sculpture is much more limited in regard to subject than painting, — a consideration we must carefully keep in view, for very frequently a work of sculpture is displeasing, not from any fault in the execution, but because it ought never to have been executed at all, because it represents that which is essentially unfitted for sculptural treatment. We should be able in looking round these courts of modern sculpture to designate the subject, its appropriate conception and artistic treatment.

"The subject is classical when it is selected from the ancient mythology and poetry. Thus, Cupid is a classical subject, whether treated *à l'antique* with Greek simplicity and consummate purity of taste, or with modern sentiment.

"Strictly speaking, modern sculpture would comprise all that is not antique sculpture. But for the purposes of critical discrimination, we divide the history of sculpture into five periods: —

"1. That which preceded the highest development of Greek art, comprising the Egyptian, Ninevite, and Lycian remains. 2. What we call the "Antique," comprehending all the sculpture of the Greeks and Romans, down to the complete subversion of the Roman Empire, that is, from about B. C. to the sixth century of our era. 3. Mediæval sculpture, comprehending all those productions of the art which date from the

sixth to the twelfth century. During this time we find sculpture chiefly in alliance with architecture, and devoted almost entirely to religious purposes. The examples which remain to us of this period we call Byzantine and Gothic. They are often curious for their significance, and interesting from their sentiment; but as far as knowledge of art or elegance of form is concerned, they must be pronounced crude. 4. The period which we style the Renaissance (revival) comprehends all the productions of sculpture from the revival of literature and art in the fourteenth to the end of the seventeenth century. In the beginning of this time the art was struggling between a newly-awakened admiration for the beautiful remains of antiquity and an ignorance of the principles on which they were produced. There was a leaning to the picturesque and Gothic in style, redeemed by exquisite grace and elevated feeling, and often by an elaborate elegance of execution. But by degrees, as the real spirit of antique art was misapprehended, and the imitation of nature was neglected and even contemned, the taste became more and more mistaken and depraved and reached its utmost point of caprice and degradation in the works of Bernini and his followers, towards the close of the seventeenth century.

"The observer will find in the various courts of architecture and sculpture at the Crystal Palace, — Assyrian, Egyptian, Greek and Roman, Byzantine, Mediæval, Renaissance, — specimens of all the periods here mentioned, from the human-headed bulls of Nineveh down to the "Nymph of Fontainebleau."

"5. Modern sculpture dates from the close of the seventeenth century to the present time; but till the middle of the eighteenth century, and even later, the influence of the late Renaissance school, more or less modified by national or individual influences, reigned paramount. A style at once pompous and fantastic, that of Louis Quatorze, pervaded the arts of Europe. In the beginning of the last century there were no schools or ateliers of sculpture but the French.

"In looking over the courts of modern sculpture, we cannot but be struck by some national characteristics. In the English school of art, with some brilliant exceptions, the general faults are negative, — a want of largeness of style, a poverty of invention, a want of fire and vigor in conception and of elegance in execution. In the best works there is a purity and depth of feeling, united to great elegance of execution. In the French school there is a tendency to the capricious, the sensual, the meretricious. In the German school we are struck by power and poetical feeling, and by a largeness of style, but also frequently by exaggeration and the want of grace and repose. In the best Italian examples, there is much fire and poetry of conception and delicacy in the treatment; the faults most predominant in the Florentine and Roman schools are feebleness and mannerism. It will be remarked that the Milanese sculptors, who rank high in point of originality and talent, have taken a decided turn to the romantic and picturesque style of art.

"In none of the fine arts does such an amount of ignorance prevail as in sculpture. It is a universal complaint with sculptors that they are forced to deviate from their own convictions of the true and the beautiful to please the unrefined taste of patrons."

IX.

DESIGN APPLIED TO PRINTED FABRICS.

THE art of printing goods may be said to have been created within the last fifty years. As practised in the early part of the century, it was comparatively rude. The designs to be impressed upon the cloth were engraved upon a square block of wood, and the color being applied to this, it was impressed upon the cloth, which was then drawn forward, and a new application of the block made.

This was the style of printing practised originally by Robert Peel, grandfather of the prime minister of England. An improvement was afterward made by engraving the design upon a copper cylinder, and by passing the cloth over this, the work was done with more precision and continuity. This method was costly, however, for one such cylinder engraved would print only 1500 pieces of cloth. Mr. Perkins of Newburyport, Mass., then invented the die. This is a steel roller, on which the design is engraved, and made exceedingly hard. From this it is conveyed by pressure to a soft steel roller, which prints the cloth. The original block printing would take but one color; now, by engraving the dies and rollers with portions of the designs, several colors may be printed. The rollers are placed upon the printing-machine in such a manner that the cloth passes slowly over the large drum of the machine, and each in succession impresses it with its special design and color. The style and quality of ladies' dress goods of cotton and of wool have thus made rapid strides in the last few years.

The felting qualities of wool have caused it to be used for many important purposes, among which are the manufacture of piano-covers and druggets, designs being printed upon them. Oil-cloths are printed in a very different manner. The cloth used is several feet in width, and in length sometimes exceeds one hundred yards. Large pieces of suitable length are cut off, stretched on wooden frames, and a solution of glue or a glue size is applied, which enters the pores and makes a surface or ground for the first coat of paint. This ground, while damp, is rubbed with pumice-stone, and when dry the first coat of paint is laid on, and well worked into the cloth. In two weeks this is dry, and the last coat is put on with a brush, which forms the ground on which the design is to be placed. Two or three months are

required to complete these operations, and the canvas, for it has now become such, is ready to be placed upon the tables, where it is stamped with large wooden types made of pear-tree wood.

In different ages, people have had many diverse ideas as to the forms best adapted for the decoration of surfaces, but all unite in one common thought in the very general use of geometrical forms. Far back in the early ages we find these forms used more than others, and they seem the most suitable for printed materials.

The savage tribes knew nothing of *printing* goods, yet they had the idea of decoration in one way and another. A few simple tools were all the instruments they possessed with which to stamp their goods; but with these few, prompted by genius in many cases, they produced beautiful designs. The simplicity of the several portions or units of design constituted the charm of their productions. Leaves of various kinds were interspersed with simple geometrical forms, as stars or dots, giving a new and ever-varying effect. Thus the possession of such simple tools, even by the most uncultivated, if guided by an instructive observation of the forms in which all the works of nature are arranged, would lead to the creation of all the geometrical arrangement of forms with which we are acquainted.

The secret of success in all ornament is the production of a broad effect by repetition of a few simple elements. Variety should rather be sought through the arrangement of the several portions of the design than in the multiplicity of varied forms. Graceful symmetry and perfect distribution in design was characteristic of past ages, and the same ought to be applicable to the present.

If ornaments are used for a design of any of these fabrics, strive to omit all shadow or relief. If flowers or foliage or any natural object is to be the element, we should study nature closely first, and conventionalize these forms previously found to be fit subjects for design.

Let the ornament cover the surface either by a form based on a geometric figure or growing out of itself by graceful, flowing curves. Any arrangement that carries lines or represents figures in the direction of breadth, should be avoided, and the effect produced by the folding of goods should be made a study. The size of the pattern should be regulated by the material for which it is intended, — small ones for close, thick materials, as gingham; larger for fabrics of more open texture, as muslins, bareges, etc. In delaines the surface must be largely covered, while in cotton prints, the designs can be more dispersed.

The chief fault of patterns, as applied to fabrics generally, is their want of simplicity, — want of simple structure, want of simple treatment, want of simplicity of effect; and together with these we find largeness and coarseness of parts. Vitruvius has said that "the perfection of all works depends on their fitness to answer the end proposed, and on the principles resulting from a consideration of nature itself."

A surface should not be divided for the purpose of decoration into halves, the proportion of 1 to 1 being bad; for as proportion increases in subtlety it

also increases in beauty. The proportion of 2 to 1 is a little better, but of 3 to 8 or 5 to 8 is still more pleasing.

A principle of order must prevail in every ornament or composition. Confusion is the result of accident, while order results from thought and care. The orderly repetition of parts frequently aids in the production of ornamental effects. If plants are employed as subject, they must never be treated imitatively, but be rendered into ornaments by being used conventionally. No shaded ornament can be pleasant when placed as a decoration on a flat surface.

If the pattern is to be wrought by printing, then one class of conditions must be complied with ; if by weaving, then another class calls for considerations. The requirements of manufacture are very numerous, and in some cases very restrictive. The size of the "repeat," the manner in which color can be applied, the character of surface attainable, and many other considerations, must be carefully complied with before a pattern can appear as a manufactured article.

No matter how simple the "repeat" that is left with the designer, he has a large field in which to work ; but he cannot go beyond certain bounds if he intends to produce first-class designs. In the past, the most popular designs have been based upon conventionalized flowers and foliage, with the abundant use of geometrical forms.

The first accounts we have of a covering for the floor is in the earlier times, when sand was first used ; then the habit of applying reeds succeeded, and on the part of the rich, sweet-scented reeds ; this use of reeds was succeeded by the employment of straw mats, formed of a kind of grass ; then by the introduction of wool mats ; these in turn were followed by carpets of various kinds, which gradually increased in size until they covered the whole floor. It does n't seem strange that man desired improvements of this kind, as he had been used to treading on grass, and when brought into a state of civilization sought some covering for his floors which would be softer to the tread and richer in color than stones or brick.

The surface of a carpet serving to support objects should be quiet and negative, without strong contrast of either form or color. The leading forms should be so composed as to distribute the pattern over the whole floor, not pronounced either in the direction of length or breadth, all up and down treatment being erroneous. The decorative forms must be flat, without shadow or relief, whether derived direct from ornament or directly from flowers or foliage. In color, the general ground should be negative, low in tone, and inclining to the tertiary hues, the leading forms of the pattern being expressed by the darker secondaries, and the primary colors or white, if used at all, should be used only in small quantities to enhance the tertiary hues, and to express the geometrical bases that rule the distribution of the form.

The laws relating to harmonies and contrasts of color should be attended to.

X.

PRINCIPLES OF DESIGN AS APPLIED TO WOVEN
FABRICS. — COLORED MATERIALS.

CARPETS.

IN preparing designs for carpets, we should first consider the power of the carpet-loom.

The carpets best known are the Brussels. There are cheaper fabrics, such as the Kidderminster, or Ingrain, consisting of two thicknesses of carpeting imperfectly united together, which can have only two colors in any line running through its length. The best designs for this carpet are made simply of two colors, as the introduction of another color produces "lines."

The three-ply is the same kind of carpet, which has three thicknesses of carpeting, allows more colors to be used, and avoids "lines."

The surface of Brussels carpeting consists of loops, and it may have five or even six colors running throughout its length. Thus whenever one color is drawn to the surface, there remain four or five beneath. It is made upon a linen foundation, which is concealed by the interlaced worsted threads that cover it.

Brussels carpeting is sometimes woven of close texture, with the loops cut through. This makes a velvet pile, or Wilton carpet, which is rich-looking and durable.

The real Axminster carpets are the best that are made. As they are formed by the knotting of threads together by hand, any number of colors may be used in their formation. Besides these and other varieties, there are many foreign carpets, most of which are hand-made and very beautiful. The greater number of these have a velvety surface, which is sometimes rough and uneven, but rarely, if ever, inartistic.

As a carpet is a fabric to be placed beneath our feet, it should possess, as a first necessity, flatness. It should not only *be* flat, but should have the *appearance* of being flat, and be decorated in the only manner suitable for a flat surface. Its decoration should be either flat ornament, or a design handled flatly. This does not exclude flowers, leaves, plants, or ornamental forms, but it requires that they should be treated as if without roundness ;

that is to say, without light and shade, or perspective effects. Each flower petal, every plant leaf should be colored with a flat wash.

We are taught that in any branch of industrial art, work should be good and honest; that there should be nothing deceptive. If a manufactured article does not fulfil the purpose for which it was made, and do so thoroughly and well, its design is faulty. If the ornament applied to any object impairs its usefulness, or in any respect changes its character, or destroys that sense of repose and fitness that comes with true ornamental design, then the ornament is ill-fitted for its purpose. From this point of view we can see how utterly misplaced most of the designs of our carpets are.

Carpets are spread before us to walk upon. If the objects pictured upon them were real, we should not wish or even dare to place our feet upon them. In doing so we should have to walk ruthlessly over delicate flowers, or to push our way among highly-colored roses of most unnatural size; or, perhaps, to balance ourselves upon some ornamental bands of stone or wood work by which the floor is regularly divided into compartments; or to step carefully over such bands down upon soft flowers; or, perhaps, on an unusually costly carpet, where a portion of garden or landscape is spread before us to delight the eye; we should be compelled to traverse tree-tops leaning against the sky which is seen between the branches.

We are told that "it requires no small amount of art-instruction and experience to see why the direct imitation of natural objects is wrong in ornamental design. The quasi-fidelity with which the forms of a rose, a bunch of ribbons, or a ruined castle can be reproduced on carpets, crockery, and wall-papers will always possess a certain kind of charm for the uneducated eye, just as the mimicry of natural sounds in music, from the rolling of thunder to the cackling of poultry, will delight the vulgar ear. Both are ingenious, amusing, attractive for the moment, but neither lie within the legitimate province of art.

As a carpet is a background for other objects in a room, it should so fulfil that office that, while occupying a subordinate position, it should serve to enhance the beauty of everything placed upon it, and let nothing suffer in being compared with it. "Composed of sombre shades and tones, and treated essentially as a flat surface, it exerts a most valuable though subordinate influence upon all the other objects in the room. Upon it the eye rests while surveying the more important furniture; and its presence, properly treated, supplies the necessary material for a satisfactory contrast with other portions of the decoration, which proves how valuable it is as contributing to the pleasing effect of the whole apartment.

"All designs which have a tendency to divide a flat surface into distinct compartments, or have colors so distributed that they attract the eye at intervals; all designs which cut sharply from the ground, and exhibit the ornamentation in strong contrast to that which it is upon, or, by a combination of several tints of the same color, appear to relieve the ornament from its background, are false in principle and deficient in the simplicity which should characterize this branch of decoration. An evenness of effect must

be the *sine qua non* of a material which is to cover a surface that, if otherwise than flat, would not be tolerated.

"As a rule, all imitations, in whatever material, of a totally different surface from that which characterizes the material itself, are false."

As in art, a background is not without interest, although subservient to the principal objects of the picture, so in a carpet there may be leading forms visible at a distance, and details which will become apparent upon a nearer view, and others to be seen only upon a close inspection; but the pattern should seem evenly spread to produce a unity of effect and prevent the eyes from wandering to follow lines or forms.

Large patterns should be avoided, because they destroy all sense of repose, diminish the size of the room, and injure the effect of the furniture by it in a measure, dividing the attention with it. The details of a carpet-pattern should be small, even where the pattern is not.

As Brussels carpeting is but twenty-seven inches wide, and one tenth of an inch is allowed for each stitch, a pattern may be repeated three or four times in the width; or there may be but one pattern, and there may be as fine detail in the latter case as in the former.

The safest and best ground for a carpet is black or indigo-blue. The prevailing tint of a carpet should contrast rather than repeat that of the wall.

A light carpet on a floor prevents any harmonious combination of general effect.

The ornamentation of carpets should be what we call an "all-over" pattern, radiating in more than two directions, and thus covering the surface without leading the eye away from any point. This rule applies to all patterns, simple or complicated.

Let the student take almost any plant, and from its vertical stem, its leaves or its flowers, seen in profile, he may obtain vertical ornaments suitable for flat vertical surfaces; or, by placing the eye above the plant and looking down upon it, he may get a geometrical radiating form suitable for floor decoration. However the leaves may seem to be dispersed along the side of the stem, their arrangement, if the plant is perfect, being in regular order, or in whorls about the stem, will give a radiating ornament. The radiating form may be used also, for a wall ornament; but the "up and down" or vertical pattern must *not* be used on the floor.

Sir Charles Eastlake says the simplest diapered grounds are the best.

Diaper work includes that class of patterns which are either definitely enclosed by bounding lines, or at least divided into compartments of a uniform size throughout. These compartments or diapers are often of a geometrical form, and in that case may be either round or square, diamond-shaped or quatre-foiled in outline.

In a carpet there should be no violent contrasts of light and dark, or of color. A distribution of colors, nearly equal in scale of light and dark, should be adopted, secondaries or tertiaries or neutralized primaries being used rather than pure tints, and lights introduced merely to give expression to the forms.

Neutrality of effect is of two kinds. It may be produced by large masses of tertiary or neutral colors, or by the juxtaposition of the primary colors in small quantities, either alone or with the secondary colors and black or white ; but there will be a difference between the two results : for that produced by the low-toned colors will be simply neutral, while that produced by the primary colors will be "bloomy" as well as neutral, and if yellows and reds slightly predominate in the intermingling of colors, the effect will be glowing and radiant. This radiant or glowing, bloomy neutrality of effect is that which is most desirable in a carpet.

In considering designs suitable for colored goods, such as carpets, materials for wearing apparel, etc., we are continually referred to those of India and Turkey as the most perfect in arrangement and general tone and harmony of color, as well as for their flat treatment and geometrical distribution of form. Their effect seems to be the result of science, as it has never changed from the earliest known times, and has always followed certain fixed laws.

The use of colors of a negative character is the secret reason why Turkey carpets are so satisfactory to the refined taste, and it is the conventionality of Indian goods that causes them to be deservedly popular without the reason for this liking being always known. Chinese ornament, which endeavors as nearly as possible to imitate nature, has never been accepted by ornamentatists as anything but rude and barbarous, except where local tradition has preserved a style of decoration that has been either excellent in its simplicity or associated with some valuable scientific process of manufacture.

Eastern carpets teach us that bright colors are not necessarily rich or beautiful, but that tone is a great source of richness, and that it has the further merit of keeping carpets in their true place in the scale of furniture.

GARMENT FABRICS.

Over-ornamentation is the great source of error in designs for garment fabrics, for it causes the ornament to stand out from the ground, and thus attracts undue attention to itself. This may arise from the ornaments being too large for the fabric, or from too decided contrasts of color or of light and dark, or from its being overcharged with color. These causes vary, however, for different materials.

Woven patterns in satin and tabby of self-color, will allow of much larger figures than where more colors are used, either in woven or printed goods. Designs for dress fabrics are much better in small than in large forms. These should be treated flatly, without light and shade, and tending to subdued contrasts of color and of light and dark.

A geometrical rather than a dispersed arrangement of the forms is the most satisfying to the eye, and the most in accordance with sound principles, some of the best patterns being formed of diapering sprigs, leaves, flowers, or often even of simple geometrical forms regularly repeated over the ground.

The fabrics of the East India Company are designed on the principles

supposed to be just. The ornament is always flat and without shadow; natural flowers are never used imitatively or perspectively, but are conventionalized by being displayed flatly and according to a symmetrical arrangement; and all other objects, even animals and birds, where used as ornament, are reduced to their simplest flat forms. When color is added, it is usually rendered by the simple local hue, often bordered with a darker shade of the color to give it expression, but the colors of the flower are rarely introduced.

In considering the details of the Indian patterns and searching for the causes of their rich and pleasing effect, they have often been considered poor, ill-drawn, and common-place. It is the knowledge of the designer, the just appreciation of what is exactly fitted to each peculiar fabric, the delicacy with which he has made his selection of the amount of ground to be left free from ornament, and the choice of the tints for the ground and for the ornamental forms that has made these fabrics so pre-eminent that we may derive rules from them to govern us in preparing designs for all garment fabrics.

In the adaptation of these designs to different kinds of materials, such an appreciation is shown of the effect which will be produced upon them by motion, when the garments are worn, that no draught of the design can show us the beautiful results of the manufactured article.

As simplicity is one of the first constituents of beauty, we often find the simplest patterns the most beautiful; and where printing or weaving in one color is in good taste, every added difficulty in printing or weaving more colors will take so much from the original beauty of the design.

We wish to obtain in the garment what a painter calls "breadth," or "repose," and this can only be attained by great simplicity, by flat or diapered treatment of small forms, by uncontrasted light and dark, and by delicate tints of color.

Whilst "up and down" treatment in stripes and trails is good, the horizontal direction of pronounced forms is bad, since in crossing the person the pattern conflicts with all the motions of the human figure, as well as with the forms of the long folds in the skirts of the garment. For this reason large and pronounced checks are to be avoided; they interfere with the graceful arrangement of any material as drapery.

HANGINGS AND CURTAINS.

The ornamentation of textile hangings is subject to the same general laws which govern other forms of wall decoration. Flatness of treatment and subdued contrasts of color are the only safe guides.

The richest and most sober effects in silk are produced simply by the process of weaving, as the satin figure on the plain tabby ground in a self-color. With the slightest attention to the design, a good effect is produced, and the splendor of the material is well displayed. The same effect, that is the contrast of the pattern with the ground, can be produced in the weaving together of other mixed materials.

By such methods the ornament produced is necessarily flat, and the gen-

eral effect is not disturbed. A good effect may be obtained by the judicious use of two or more colors, either according to the ancient method of harmony, separated from each other by bands of black, white, or gold, or contrasted and enhanced by their complementaries, enriched by gold. The combination of many colors results only in poverty and meanness.

Where colors are used, the pattern must be smaller than where the design is woven into material of only one color. Some hangings decorated with vertical ornaments from the Alhambra are in good taste.

Hangings of rich cloth of gold brocade are sometimes ornamented with flowers rendered imitatively. Shaded, colored flowers vulgarize and destroy the richness of effect sought for in such materials; whereas a diaper design, or a different texture produced by weaving, or a mingling of silver thread with the gold, gives all that can be desired.

We read of a hanging decorated with flowers on an ash-colored lilac ground which, although displaying great ability in the designer, and equal skill in the weaver, did not compare in apparent richness with a plain mulberry-colored hanging, ornamented flatly in tabby and satin placed beside it. Had these flowers been treated flatly, arranged geometrically, and colored in simple flat tints, they would have been more suitable for and more truly ornamental to hangings.

In Gobelin tapestries, we find landscapes, figures, fruits, and flowers. Such copies of pictures are necessarily inferior in such materials to the pictures they represent. It is easily seen that it is an error to place figures and trees where a gust of wind would remove them, or a fold divide them in two. The interest felt in these tapestries, is chiefly that which clings to anything which has been cherished and admired in the past, and their association with royalty and great names.

Early in this century, window curtains were only made of silk or damask. The material known as "rep" was next introduced. This was in many respects superior. The Germans have invented a still better material known in the shops as "cotelan." This is often worked in diaper patterns of excellent design. It is one of the most artistic kinds of modern textile fabric. The French have given us a heavy ribbed material decorated with broad bands or stripes of color running transversely to its length, like the pattern of a Roman scarf. Of late years this has been much used, especially by artists.

There is a striped damask, whose stripes run parallel to the length of the curtain, which increases the apparent height of the room. A curtain in folds is better with horizontal stripes, as vertical stripes create confusion.

Under the subject of hangings we may also consider chintzes. This material being essentially a summer fabric, any decoration tending to a sense of warmth is out of place. Thus there should be no richness of color. Cool, fresh grounds, covered with flat, ornamental forms, either in "all-over" or "up and down" arrangement, or a diapered floral treatment on a simple, plain ground, are the most suitable designs for chintzes.

LACE.

In considering the ornamentation most suitable for lace, its texture, lightness, and fineness should not be overlooked. All designs should be light, elegant, and flowing. Graceful forms should mark its ornamentation, and straight lines should be avoided. At the same time, care should be taken that these lines be not so light as to render the lace flimsy, and thus, where lace is used as a trimming, deprive the line, which should be enriched with ornament, of its proper expression.

The old point lace, worked with a needle, was often too heavy in character, wanting less crowded spots to give relief to the design, whereas in modern times the manufacturer has run into the other extreme, by covering much space with little labor.

The edge or border constitutes true lace. This should be decidedly rich in ornament. In wide pieces of lace and veils there should spring from the border graceful curved forms, gradually disappearing in diapered sprigs or ornamental forms to cover the remaining surface. The natural lines of the growth of plants, arranged according to some symmetrical order, may be adopted.

Exact imitations of flowers are to be avoided, floral forms being followed. The petals and leaves should rarely be filled in solidly. Stitches of varied forms should be introduced, giving a diaper texture, and thus adding to the lightness and richness of the material.

The designs for lace curtains should be such as not to be too much hidden in the folds. There should be no irregular scrolls or bouquets of flowers. The best designs give us a border of some plant of graceful foliage and characteristic outline, the body of the curtain being powdered over with details of the plant used, arranged in geometric forms. The symmetrical snow-flake gives a light, geometric form, which, when so placed, is pleasingly suggestive. There should be no attempt at shading forms. It is also evident that designs which very much cover the surface and destroy the transparency, are not adapted for a texture requiring clearness or semi-transparency as its chief quality.

HAND-MADE LACE.

Lace is made of flax, cotton, and mohair, and of silk, gold, and silver. It is said to have originated from the open-work embroidery which came into use in the sixteenth century. This was made by pulling out certain threads in regular order, and stitching the remaining threads together. They were worked in button-hole stitch, in various geometrical patterns, the superfluous cloth being cut away. This was termed "cut-work." There was also a kind of darned netting. In making this a net-work was arranged, either in squares or in lines radiating from a centre, upon a frame. Upon this netting patterns were wrought with a needle. This same method has been revived at the present day.

Lace consists of two parts, — the ground and flower, pattern or "gimp."

The flower or ornamental pattern is either made together with the ground, as in Valenciennes or Mechlin, or separately, and then either worked in or sewn on, "appliqué."

Some laces are not worked on a ground. The flowers are connected by irregular threads, overcast (with button-hole stitch), and sometimes worked over with pearl loops (picot) such as the points of Venice and Spain, and most of the guipures.

All lace is terminated by two edges, — the pearl or picot, a row of little points at equal distances, and the footing, a narrow lace which serves to keep the ground firm and to sew the lace to any garment.

Lace is divided into point and pillow. The first is made by the needle, on a parchment pattern, and termed "needle-point." Point also means a particular kind of stitch, as "Venice point," "Brussels point." The following is the manner of making pillow lace: The pillow is a round or oval board, stuffed so as to form a cushion, to be placed on the knees of the work-woman. On this pillow a stiff piece of parchment is fixed, in which small holes are pricked to mark the pattern, and through these holes pins are stuck into the cushion. The threads with which the lace is formed are wound upon "bobbins," — formerly bones, now small pieces of wood about the size of a pencil, — having a deep groove round their upper ends, so formed as to reduce the bobbin to a thin neck, a separate bobbin being used for each thread. By the twisting and crossing of these threads the ground of the lace is formed. The pattern or figure called "gimp" is made by interweaving a thread much thicker than that forming the ground-work, according to the design pricked out on the parchment. This has been the method of using the pillow, with slight variations, for three centuries.

The Italians claim the invention of point or needle-made lace. They probably derived it from the Greeks of the Lower Empire who took refuge in Italy. Its Byzantine origin is further confirmed by the fact that those places which kept up the closest intercourse with the Greek Empire are the cities where point lace was first made and most flourished.

A modern Italian author asserts that the Italians learned embroidery from the Saracens of Sicily, as the Spaniards acquired the art from the Moors of Seville or Grenada. As proof of his theory, he states that the word "to embroider," both in Italian and Spanish, is derived from the Arabic, and that no similar word exists in any other European language.

Evidences of lace fabrication appear in Italy as early as the fifteenth century. Lace appears on garments in pictures of that date.

Lace was made throughout Italy by nuns and for the service of the church. Venice was celebrated for her point, while Genoa produced almost exclusively pillow lace. These laces, with the addition of Milan lace, were those best known in the commercial world in the earlier periods.

The earliest points soon passed from the stiff Gothic forms into the flowing lines of the Renaissance, and into that fine, patternless guipure called Venice point.

One fine Venice lace, the richest and most complicated of all points, is

made on a parchment pattern, with all the outlines in relief, formed by means of cottons placed inside to raise them. Sometimes they are in double and triple relief; an infinity of beautiful stitches are introduced into the flowers, which are surrounded by pearls of geometric regularity, the pearls being sometimes in scallops. This is the Rose (raised) Venice point so highly prized and so extensively used for albs, collarettes, berthas, and costly decorations.

These Venice points are said to be such fine and wonderful works of the needle that they baffle all description, and are endless in variety. The only relic remaining of Venice point is a coarse, cheap lace offered to travellers by the peasant women.

The term "guipure" is now so variously applied that it is impossible to limit its meaning; the modern Honiton and the Maltese lace are called guipure, as well as the imitations of the latter. The Italians called the old raised points of Venice and Spain guipures. The finest thread guipures were the produce of Flanders and Italy, although when this term was first applied to thread guipures is uncertain; but silk twisted round thick thread or cord was originally called guipure, and from this the work is said to have derived its name. In early times, such lace was made of silk, gold, or silver, with the needle, or on a pillow like other laces, and was very costly.

In early times the Genoese made much gold lace. This consisted of pure gold mixed with Spanish "laton," producing a false gold such as is now used for theatrical purposes. They also made gold and silver lace out of drawn wire, such as has been lately found at Herculaneum.

In the seventeenth century the Genoa point came into general use throughout Europe. These Genoa points, so highly prized, were all the work of the pillow.

Lace manufacture extends along the sea-coast of Northern Italy. The workers are mostly the wives and daughters of the coral-fishers, who support themselves by this occupation during the long and perilous voyages of their husbands. In the year 1850 the lace-workers in this part of Italy began to make guipures for France, and these now form their chief produce. The exportation is very great, and lace-making is the daily occupation not only of the women, but of the ladies of the commune.

MALTA LACE.

The lace once made in Malta was a coarse kind of Mechlin or Valenciennes of the arabesque pattern. In 1833 Lady Hamilton Chichester induced a woman named Ciglia to copy an old Greek lace coverlet in white. The Ciglia family from that time commenced the manufacture of black and white Maltese guipure, until then unknown in that island.

Malta lace is also made in the Madeira Islands by seven families. It is made almost entirely by men; the women occupy themselves in the open-work embroidery of muslin and cambric.

Spanish point in its day was as celebrated as that of Flanders and Italy. Tradition declares that Spain learned the art from Italy, whence she com-

municated it to Flanders, which in return taught Spain to make pillow lace. Others give it a Moorish origin.

Spain was early celebrated for its silk laces, which, with its colored embroidered laces, and its gold and silver points, have always enjoyed a certain reputation. The national mantilla is the principal manufacture of the present time; this is made in both white and black lace. Spanish silk laces do not equal in workmanship those of Bayeux and Chantilly either in firmness of ground or regularity of pattern.

The manufacture of blonde lace is almost confined to Catalonia. It is made in the villages on the sea-coast, especially in Barcelona. It gives employment to thirty-four thousand people. There are no large manufactories: it is in the hands of women and children, who make it on their own account and as they please.

Lace-making is a great source of wealth to Belgium, some of its old cities being supported by female industry. One fortieth of the whole population, 150,000 women, are thus employed. The majority of these work at home. The trade is now as flourishing as it was in the most palmy days of the Netherlands.

The lace manufacture of the Netherlands has a glorious past. After causing jealousy in every other European nation in the sixteenth century, when every other industrial art disappeared in the midst of the horrors of a religious persecution, this fabric alone maintained itself, and through its prosperity saved Flanders from ruin.

In Belgium, lace-making plays a prominent part in the education of children. Charles V commanded it to be taught in schools and convents.

BRUSSELS LACE.

The manufacture of Brussels lace is supposed to have commenced at the beginning of the fifteenth century. It is falsely called English point. This name was applied to it in 1662. At that time the English Parliament forbade all importation of foreign lace; and the merchants, after bringing Flemish workmen to England, finding it impossible to provide the necessary flax, resorted to the expedient of buying the choicest laces of the Brussels market, which they smuggled into England and sold as "English Point."

The finest Brussels lace can only be made in the city itself. Other localities have tried in vain to compete with the capital. The thread used in Brussels lace is of most extraordinary fineness. It is grown in Brabant at Hal and Rebecq-Rognon. The finest quality is spun in underground rooms, as contact with the dry air causes it to break. It is so fine as to be almost invisible. The "feel" of the thread as it passes through the fingers is the surest guide.

The thread-spinner closely examines every inch drawn from her distaff, and when any inequality occurs, repairs the mischief. Every artificial help is given to the eye. A background of dark paper is placed to throw out the thread, and the room is so arranged as to admit one single ray of light upon her work. It is the fineness of the thread which renders the real Brussels

ground so costly. The difficulty of procuring this thread, at any cost, has prevented this art from becoming established in other countries. The ground of Brussels lace is made in two ways, by the needle and the pillow. The needle-ground is superior to the pillow-made. It is worked in small strips of an inch in width, joined together by a stitch long known to the lace-makers of Brussels and Alençon only. Since machine-made net has come into use, this needle-ground is rarely made.

There are two kinds of flowers, — those made with the needle, called *point à l'aiguille*, those on the pillow, *point plat*. The best flowers are made in Brussels itself, where they have attained a perfection unapproached by those made in the villages and Hainault.

In the old laces, the *plat* flowers were worked in together with the ground, application lace being formerly unknown.

In making Brussels lace, each part is assigned to a different person. The worker has a piece of parchment given her, on which the pattern is pricked out; she only knows of the portion she is to make. The whole responsibility rests with the master; he alone knows the effect to be produced; he selects the ground and chooses the thread and cuts up the pattern for the different workwomen.

The pattern of Brussels lace has always followed the fashions of the day. The most ancient is the Gothic style, composed of architectural ornaments resembling patterns cut out in paper. This style was replaced by the flowing lines which prevailed until the Revolution of 1789. In its turn followed the flowery style of the First Empire, — an assemblage of flowers, sprigs, columns, wreaths, and small patterns, such as spots, crosses, etc. In flowers, the palm and pyramidal forms predominated. Under the Restoration, the flowery style remained unchanged, the palms and pyramids becoming more rare. Since 1830 great and rapid changes have taken place in the patterns. Every year they become more true to nature and more artistic.

MECHLIN LACE.

Mechlin is one of the prettiest of laces, — fine, transparent, and effective. It is made in one piece, on the pillow, with various fancy stitches introduced. Its distinguishing feature is the flat thread, which forms the flower and gives to this lace the character of embroidery. This manufacture had died out and been replaced by other laces. In 1699, when the English prohibition was removed, Mechlin lace became the great fashion of the day, and continued so for a century.

VALENCIENNES LACE.

The manufacture of Valenciennes, having expired in its own native city, has become one of the most important branches of the pillow-lace trade in East and West Flanders.

The productions of Ypres are of the finest quality and of the most elaborate workmanship. On a piece not two inches wide, from two hundred to three hundred bobbins are employed, and for the larger widths as many as eight hundred, or more, are used on the same pillow. The ground is in large,

clear squares, which throws up the even tissue of the pattern. Until 1833 there was little variety in the patterns, when a clear, wire ground was introduced, with bold, flowing designs.

The Valenciennes of Bruges has never been so highly valued as those of Ypres and Alost; for while in making the former the bobbins are only twisted twice, in the latter two the twisting is repeated four or five times. The oftener the bobbins are twisted the more the Valenciennes is esteemed.

The original Valenciennes lace was made in underground cellars, where the lace-makers worked from four in the morning until eight at night. This work was generally done by young girls, many of the women becoming almost blind before reaching the age of thirty.

Under the impulse of fashion and luxury, lace receives the stamp of the special style of each country. Italy furnishes its points of Venice and Genoa; the Netherlands its Brussels, its Mechlin, and Valenciennes; Spain its silk blondes; England its Honiton; France its costly point d' Alençon, its white blondes of Caen, and its black lace of Chantilly. Now each style is copied by every nation, but France is unrivalled in her "points d' Alençon," her white blonde, and her black silk laces. The Alençon point is the only French lace not made on a pillow. The invention of this lace was occasioned by the efforts of Colbert to introduce Venice point into France. In the time of Louis XIV the fashion of wearing costly laces had reached the most extravagant bounds. Gentlemen wore point-lace ruffles at their boot-tops, which were sometimes filled with a number of rows of lace. Cinq-Mars, the favorite, left at his death three hundred pairs of lace-ruffled boots. The garter above these boots consisted of a scarf worn around the knee, having the ends adorned with lace. A large rosette of lace on the foot completed the costume.

The Government vainly endeavored, by sumptuary laws, to restrain the extravagance of the people. Prohibitions of importations did not fully avail: the people were unwilling to give up their exquisite points for the coarse laces of France. Under these circumstances, Colbert proposed introducing the manufacture of costly lace into France, so that the money expended on this luxury might not impoverish the country. A Madame Gilbert, of Alençon, with thirty workwomen from Venice, was engaged to carry on the enterprise. Madame Gilbert, with her Italian assistants, finding it difficult or impossible to teach the people to imitate the true Venetian stitches, invented a new lace; and by giving out to the workwomen different portions to make, and afterwards joining them together, she succeeded in making the most elaborate point ever produced.

Point d' Alençon is made entirely by hand, with a fine needle, in portions, upon a parchment pattern, afterwards united by invisible seams. As each part is executed by a special workwoman, it requires twelve persons to complete a piece of lace. This lace was nearly extinct when Napoleon caused it to be restored. Alençon again fell with the Empire; after many attempts, it was restored under the last Empire, and is now in the highest favor. The earlier patterns of the eighteenth century are flowery and undu-

lating. In the time of Louis XV a change came over lace, as over the architecture and home decoration; the patterns became more rigid and angular, and almost conventional in form. With Louis XVI the ground of lace was covered with little bouquets and spots, which towards the end of the century were given up.

The Alençon was never equal to the Brussels in its designs; they were seldom copied from nature, while the fabric of Brabant was decorated with accurate copies of roses and other flowers. There has been a great improvement in the Alençon. The present patterns are copies of flowers, intermixed with grasses and ferns.

In Normandy both white and black laces are made, but the black lace is chief in importance. The prosperity of Calvados, where, in 1851, about 50,000 persons were employed in making lace, is due to the invention of a stitch, the "point de Raccroc," by which the pieces of lace worked in different segments are united. Thus shawls, flounces, and large pieces are made in small sections and then joined together. Black lace is usually made in winter, white in summer.

The lace manufacture of Auvergne, of which Le Puy is the centre, is the most ancient and considerable of France. There are nearly 130,000 women employed in this work. Excepting at the time of the French Revolution, this trade has been always prosperous. Le Puy produces every kind of lace, —white and colored, silk, thread, and worsted, blonde of all kinds, and black of the finest grounds; her productions range from gold and silver lace to the cheapest edgings.

Lace-making was introduced into Devonshire, England, by some Flemings, refugees from the persecutions of the Duke of Alva. Honiton lace, so called from the town of Honiton, preserved its Flemish character.

HONITON LACE.

The peculiarity of Honiton lace is its being made in sprigs, which have been scarcely surpassed by the lace-makers of Brabant; they are made separately. At first they were worked in with the pillow, but afterwards *appliqués*, or sewn in on the ground; of late years, sprigs, when made, are sewn on paper, and joined either on the pillow by purlings, or by the needle in various stitches, or by purlings made by the yard.

From a falling off in its patterns, Honiton lace has fallen into disuse. At the Exhibition of 1862, the Honiton lace, though exquisite in workmanship, could ill bear comparison with the Brussels.

Within the last quarter of a century the taste for lace has revived; and although many may condemn its use as extravagant, it must be remembered that its manufacture furnishes employment to thousands of women who would otherwise be forced to leave their homes to toil for a livelihood in no less laborious, no more remunerative, and far less refining occupations.

MACHINE-MADE LACE.

The manufacture of lace has its epochs, — 1768, net first made by machinery; 1809, invention of bobbin-net; 1837, the Jacquard system applied to the bobbin net machine.

Barbara Uttmann made a plain thread net, in Germany, three centuries before any attempt was made to produce it by machinery.

The invention of machinery for lace-making is usually assigned to Hammond, a stocking-frame knitter of Nottingham, who, examining one day the broad lace on his wife's cap, thought he could apply his machine to the production of a similar article. He so far succeeded that by use of the stocking-frame, invented in the previous century, he produced, in 1768, not lace, but a kind of knitting, of running loops or stitches, like that afterward known as "Brussels ground." In 1777 Else and Harvey introduced the point-net machine, so called because made on sharp pins or points. Other improvements followed, but machinery had not yet arrived at producing a solid net: it was still only knitting, a single thread passing from one end of the frame to the other, and if a thread broke, the work was unravelled. The threads, therefore, required to be gummed together to give stiffness and solidity to the net. To remedy this evil, the warp or chain machine was invented, which was again improved and made "Mechlin net," from which the machine took its name.

The machine for making "bobbin-net" was invented by John Heathcoat in 1809. "Bobbin-net" was so named because the threads are wound upon bobbins. It was "twisted" instead of "looped" net. There are now machines which make net three and a half and five yards wide.

The work done by the bobbin-net machine consists in the coiling of one set of threads around another. The machine by which this is effected is a singularly complex piece of mechanism. The principle of the invention was the use of fixed parallel warp threads, round which the bobbin threads were worked as the woof of the fabric, one set going obliquely across from right to left, and the second set obliquely across from left to right. The bobbin threads are made to pass to and fro between the vertical threads, and to twist around them by a combination of movements. The vertical threads shift laterally to and fro; the bobbins have a backward and forward motion, like the pendulum of a clock, and the frame to which they are all attached has itself a distinct movement. Sometimes there are as many as three or four thousand bobbins to one machine capable of making net five yards in width.

In the machine, the warp threads, to the number of seven hundred to twelve hundred in a yard of width, are stretched upon a roller which extends the whole length of the thread-beam, and the woof threads are wound each upon a bobbin formed of two thin brass disks riveted together, leaving a narrow space between them for thread. These bobbins are fixed upon a small carriage or frame which moves backwards and forwards like a weaver's shuttle.

The pieces of bobbin-net measure twenty or thirty yards each ; the width is variable.

The narrow strips — even the narrow quillings used for cap-borders — are made by the same machine, many breadths together, which are temporarily united by threads that are finally drawn out.

A Jacquard apparatus is attached to some of the machines for working in the thick thread of gimp for the ornamental figures.

Where the thread passes from one figure to the other, it is clipped off by children. At many of the factories the pattern is worked in by hand.

The Government School of Design at Nottingham has educated many skilful designers, who prepare the pattern upon wood or stone, as for engraving or printing, those parts intended to leave a mark being in relief. The block, being moistened by some colored pigment, is repeatedly impressed upon the net, until the pattern is transferred to the whole surface designed for it, and the figure is then worked with the needle, the web being extended horizontally in a frame.

Bobbin-net and lace are cleaned from the loose fibres of the cotton by the ingenious process of "gassing," as it is called. A flame of gas is drawn through the lace by means of a vacuum above. The sheet of lace passes to the flame opaque and obscured by loose fibres, and issues from it bright and clear, not to be distinguished from lace made by the purest linen thread, and entirely uninjured by the flame. The net is stiffened by being dipped in a mixture of gum and paste, then stretched, and afterwards rolled and pressed.

In 1834 eight bobbin-net machines were set up in Brussels for the purpose of making the double and triple twisted net, upon which the pillow-flowers are sewn to produce the Brussels application lace. In a few years they succeeded in excelling the English manufacture, and this net has for nearly thirty years superseded the expensive pillow-ground.

Brussels produces little else but this extra fine ground, which is universally known as "Brussels net."

MACHINERY LACE.

While England boasts of the invention of bobbin-net, France made application of the Jacquard system to the net frame in 1837, and consequently claims the invention of machinery lace. Shawls and larger pieces of "run lace," as it is termed, had previously been made after this manner. The pattern proposed to be "run in" is printed by means of engraved wood blocks on the ground, which, if white, is of cotton, if black, of silk.

The ground is stretched on a frame ; the "lace-runner" places her left hand under the net, and with the right works the pattern. The filling up of the interior is termed "fining," or "open working," as the original meshes of the net are brought to a smaller or larger size by the needle.

The Jacquard system had been used at Lyons in 1823-4, with the Mechlin frame, for making patterned net and embroidered blondes ; this suggested the application of the Jacquard cards to making lace. In 1836 to 1838 Mr. Ferguson, by applying it to the circular bobbin-net frame, brought out the

black silk net imitation of Chantilly. The pattern was woven by the machine, the brode, or relief, "run in."

Nottingham and Saint-Pierre-les-Calais rival each other in the variety of their productions.

The French, by adopting what is technically termed eight "motives," produce their lace of a finer make and more complex pattern.

The Calais lace is an admirable copy of the square-grounded Valenciennes, and is the staple trade of the manufacture. Calais also produces black and white blondes, fancy nets of various patterns, the *dentelles de laine* of Le Puy, together with black and white laces innumerable.

Almost every description of lace is now manufactured by machinery, and it is often no easy task, even for a practised eye, to detect the difference. Still the most finished productions of the frame never possess the touch, the finish, or the beauty of the laces made by hand.

The invention of the machine-made lace has not diminished the demand for the finer fabrics of the pillow and the needle. The rich have sought more largely than ever the exquisite works of Brussels or Alençon, since machinery has brought the wearing of lace within the reach of all classes of society.

XI.

FLAT OR SURFACE DECORATION.

SURFACE decoration or ornamentation must have been practised at a very early period ; for as far back as any records in history relating to the decorative arts take us, we find that it was, in various ways and upon various objects, by different nations and classes of people. The savage tattooed his body and decorated the walls of his hut with hideously grotesque, roughly drawn designs, representing his uncivilized ideas, and destitute of any principles of form or beauty. Certain savage races, however, have displayed much taste and power, considering the materials at their command, in ornamenting their weapons of war, their persons, etc.

Leaving decoration amongst savage races, let us notice some characteristic features of its use by the more civilized nations, possessing and cultivating principles of ornament which show a knowledge of the true principles of form and beauty as relating to the decorative arts, whether symbolic or æsthetic. All good ornament and good decoration have qualities which appeal only to the educated mind. But before we can rightly understand these, it will be necessary for us to inquire into the general revelation which the ornament of any particular nation or people makes to us.

Illustrations of ornament composed of the conventionalized lotus or water-lily may be found on nearly every Egyptian object of utility or ornament ; and this device is repeated over and over again. The peculiarity of the drawing of the Egyptian lotus expresses the peculiarity of Egyptian ornament, namely, a severity, a rigidity of line, a sort of sternness, coupled with an amount of dignity which is very apparent. The priesthood, perceiving the watchfulness manifested by the people for the coming of the lotus, — for it was the first flower to make its appearance after the subsidence of the overflowing of the Nile, — taught that in it abode a god, and that it must be worshipped ; and thus the lotus became an element of ornamentation and an object of worship. Another device in Egyptian ornament is the “winged globe.” This ball or globe, from the sides of which extend two wings, each being from five to eight times its diameter, was symbolical of the power of the kingdom of Egypt. The priesthood taught that it was a symbol of protection, and it was placed on the lintel of every house of the Egyptians, as well as on many other objects. Thus we see that Egyptian ornament was symbolic

in character. Many principles of great value to the decorative artist, are derivable from it.

In Greek ornament and decoration we find forms having a different object and a different aim from those of the Egyptians. It is not symbolic. The Greeks, being a refined people, sought to express refinement in their works. In one respect the Greeks resembled the Egyptians, for they rarely created new forms. When once a form became sacred to the Egyptians it could not be altered; but in the Greeks, while bound by no law, the love of form was great. They did not, however, simply reproduce what they had created, but labored hard to improve and refine it, and even through succeeding centuries strove to refine those simple forms and ornamental compositions which have become characteristic of them as a people. The general expression of Greek art is that of refinement, and the manner in which their delicately cultivated taste is expressed in their ornament is astonishing. One decorative device of Greek ornament, the Anthemion, may be regarded as their principal ornament, and the variety of refined forms in which it appears is most interesting. Great as is the beauty of some of these forms, we notice that they show something more than the perfected taste of their producers, for they reveal to us the fact that their creators had a great knowledge of natural forces and the laws by which these forces were governed. This becomes apparent when we inquire into the manner in which they arranged the proportions of the various parts of their work to the whole, and especially when we consider the subtile nature of the curves which they employed both in architectural members and decorative forms.

There is much that is worthy of study in the decorative works of the Persians, the Indians, the Chinese, and others, but our space will not allow us to dwell on the beauties of each. The decoration of the Moors is most exquisite and beautiful. The simplicity of arrangement of the varied geometric forms upon which it is based, and the principles and laws by which the Moors were governed in the division and subdivision of forms used in decoration, are well worthy the careful study and consideration of the decorative artist. But there are other meanings in ornament, and other general expressions which decorative forms convey to the mind. Thus sharp, angular, or spiny forms are more or less exciting, while bold and broad forms are soothing and tend to give repose.

Nothing can be more important to the ornamentist than the scientific study of art. The inquiry into cause and effect as relating to decorative ideas is very important, indeed all-important, to the true decorator. He must constantly ask himself what effect such and such a form has upon his mind; which effects are soothing, which cheerful, which melancholy, which rich, which ethereal, which gorgeous, which solid, which graceful, and so on; and in order to do this he must separate the various elements of composition, and consider those parts, so as to be sure he is not mistaken as to what affects his mind in any particular manner, and then combine these elements in various proportions and consider the effects of the various combinations on the minds of others, and he will thus discover what will enable him to so act

upon the senses as to induce such effects as he may desire to produce. Let the sense of the decoration of a dining-room be that of richness, of a drawing-room, cheerfulness; of a library, worth; of a bed-room, repose. Glitter should never occur in large quantities, for that which excites can only be sparingly indulged in; if it is too frequently employed, it gives the sense of vulgarity. All decoration should possess and represent truthfulness; for what is more immoral or base than false ornament and decoration?

Ornamentation is, in the highest sense of the word, a fine art; there is no art more ennobling, none more exalted. It can cheer the sorrowing; it can soothe the troubled; it can enhance the joys of those who make merry; it can inculcate the doctrines of truth; it can refine, elevate, purify, and point onward and upward to heaven and to God. This being the case, those who ignore decoration cast aside a source of refinement, and deprive themselves of what may elevate them in virtue and morals. Such neglect on the part of those who can afford luxuries would be highly censurable, were it not that many professors of the decorative arts are mere pretenders, knowing not what they practise, and ignorant of the power they hold in their hands. The true artist is a rare creature; he is often unknown, frequently misunderstood or not understood at all, and not unfrequently lost to a people that prefer shallowness to depth, falsehood to truth, glitter to repose.

Decorative forms must be beautiful. Shapes which are not beautiful can rarely be decorative. They must be truthful in expression, and graceful, delicate, and refined in outline, manifesting no coarseness, vulgarity, or obtrusiveness of character. A beautiful composition will have no parts which can be taken from it, and leave the remainder equally good or better. The perfectly beautiful is that which admits of no improvement. The beautiful is lovable, and, like all which is lovable, it takes hold of the affections and clings to them.

Having considered those principles which are of primary importance to the decorator, we may now consider the special manner in which they should be applied to the decoration of ceilings and walls of rooms.

We are met at the outset with a great difficulty. How are we to decide upon the proper decoration for a room, since its fitness is often dependent upon the structural and ornamental details of the room, and since in all cases the character of the decoration should depend upon the character of the architecture? Broadly speaking, if a building is in the Gothic style, all that it contains in the way of decoration should be Gothic. If Greek, the decoration should be Greek. If Italian, the decoration should be Italian, and so on.

The character of the decoration must be not only in the style of the architecture of the building which it is intended to beautify, but it must be similar in nature to the ornament, coeval with the architecture of the building.

It must not be supposed that we advocate the reproduction of works, or even of styles of architecture such as were created in times gone by, for we are not. The people of past ages carefully sought to ascertain their wants, resulting from climate, from the nature of their religion, and from their social

arrangements, and satisfied them as far as the building material at their command would allow. We, on the contrary, look at a hundred old buildings, and without considering that our needs differ from those of our forefathers, take a bit from one and a bit from another, or we reproduce one almost as it stands, and thus blunder on, instead of seeking to raise such buildings as are in all respects suited to our modern requirements. We are, however, improving in this respect, and changes for the better are being made.

We have said that a building should be decorated with such ornament as was, in time past, associated with its particular form of architecture. Let not the ornament, however, be a mere servile imitation of what has gone before, but let the designer study the ornament of bygone ages till he understands and *feels* its spirit, and then let him strive to produce new forms and new combinations in the spirit of the ornament of the past.

This must be studied in its purity, and not from such wretched attempts at Gothic decoration as we often see. Nothing can be worse than a bit of Greek or a fragment of Egyptian ornament, a Moorish scroll, a Gothic flower, and an Italian husk associated together in one ornament. What is recommended is the combination of new forms into compositions which may have the vigor of the best Gothic ornament, the severity of the Egyptian, the intricacy of the Persian, the richness of the Moorish, and so on, without imitating in detail the various styles of the ornament of the past.

In the decoration of a room, the question is often asked, "Why make our ceilings white?" and we are told that as whiteness renders the ceiling almost invisible it is preferred. Blue is the most ethereal and most distant of all colors; but we have been accustomed to white ceilings from our infancy, and have been taught to regard a clean white ceiling as all that is to be desired. Blue, we have said, is ethereal in character, and may become exceedingly so if of medium depth and of a gray hue; hence, if a mere atmospheric effect is sought, it would be desirable that this color be used on the ceiling rather than white. Furthermore, the ceiling may become an object of great beauty, and it can be seen as a whole. Suppose we have an ordinary room to deal with: place all over the ceiling a pattern which repeats equally in all directions; let this pattern be in blue and white, or in blue (of any depth) and cream color, and it is sure to look well, the blue being the ground and the white the ornament.

Simple patterns in cream color on a blue ground, with strong black outlines, also look well; and these may be prepared in paper and hung on the ceiling as common paper-hangings, if cheapness is essential. Gold ornaments on a deep blue ground, with black outlines, also look rich and are effective. These are all, however, simple methods of treatment; for any amount of color may be used on a ceiling, provided the colors are employed in very small masses, and are perfectly combined, so that the effect produced is that of a rich bloom. A ceiling should be beautiful, and should also be manifest. The ceiling may look well if covered all over with a suitable pattern, or it may look well with a central ornament only, or with a central

ornament and corners, especially if the cornice is heavy, so as to give compensating weight in the margin. If the ceiling is flat, all ornament placed upon it must not only be flat also, but must not fictitiously represent relief, for no shaded ornament can be pleasant when used to decorate an architectural surface.

Many circumstances tend to determine the nature of the decoration which should be applied to a ceiling; thus, if a ceiling is structurally divided into square panels, the character of the ornament is thereby restricted; and should these panels be large, it will probably be desirable that each be fitted with the same ornament; while if they are small, three or four different patterns may be employed, if arranged in an orderly manner.

A ceiling may also have joists or beams visible upon it, and in this case the decoration must be of a very special character. The bottoms of the joists may have a running pattern upon them, such as the Greek "key" or guilloche, whilst the sides may be decorated with a running pattern, or a pattern with an upward tendency, such as the Greek "honeysuckle," and the ceiling intervening between the joists with a running pattern, or better yet, a star or diaper pattern.

If, however, the ceiling is flat, and is not divided into sections structurally, almost any "setting out" of the surface may be employed. In any case it is not necessary or even desirable that the ornament upon the ceiling be in relief. Avoid an architectural setting out, if there are no structural members; for ornament which is flat may be spread in any manner over a surface without even appearing to need structural supports.

As to the color of a ceiling, if there is to be no ornament upon it, let it be cream color rather than white. Cream color always looks well upon a ceiling, and gives the idea of purity. A gray-blue is also a very good color for a ceiling.

To paint pictures upon ceilings, as has been done in some parts of Europe, is in every way wrong. 1. A ceiling is a flat surface, hence all decoration placed upon it should be flat also. 2. A picture can only be correctly seen from one point of view, whereas the decoration of a ceiling should be of such a character that it can be well seen from any part of the room. 3. Pictures have almost invariably a right and a wrong way upwards to almost all the guests in the room. 4. In order to understand a picture, you must see its entire surface at one time, which it is very difficult to do without fatiguing the neck or lying on your back upon the floor; whereas an ornament which consists of repeated parts does not require that the whole ceiling be seen at one glance.

What can be worse than painted festoons of leafage, hung like so many sausages, upon a ceiling, with griffins, small framed pictures, impossible flowers, and feeble ornament, and picked out with fictitious light and shade? But not content with such absurdities and incongruities, the festoons of leafage hang upwards rather than downwards on vaulted or domed ceilings. Such ornament was first used when Rome, intoxicated with its conquests, yielded itself up to luxury and vice rather than to a consideration of beauty and truth.

In all ages when decorative art has flourished, ceilings have been decorated, — by the Egyptians, the Greeks, and by the people of the Middle Ages.

We will now consider the manner in which ornament should be applied to walls with the view of rendering them decorative.

A wall may look well without decoration, strictly so called, and this statement leads us to notice the various ways in which walls may be treated with the view of rendering them both decorative and beautiful. A wall may be simply tinted, either with distemper color or “flatted” oil color. Distemper color gives the best effect, and is much the cheapest, but it is not at all durable. Every mark will show upon it. If rubbed, it is marked, and it cannot be washed. Oil color, when flatted, makes a good wash, whether “stippled” or plain. It is durable, and may be washed. An entire wall should never be varnished.

A good effect, of a very plain and inexpensive character, may be produced by a black skirting to a cream-colored wall, a cornice tinted with a pale grayish blue, with blue of almost any depth, with white, and a slight line of red.

A slightly more decorative character may be given to a room, by painting the lower three feet of the wall of a different color (thus forming a dado) from the upper part of the wall. Thus, if the other parts of the room are colored as in the example just given, the lower three feet may be red (made of vermilion toned to a rich Indian red with ultramarine blue) or chocolate (made of purple, brown, and white, with a little orange chrome). This lower portion of the wall should be separated from the upper cream-colored portion by a line of black an inch broad, or better by a double line, the upper line being an inch broad, the lower line three eighths of an inch, and the two lines being separated from each other by five eighths of an inch of the red or chocolate.

The formation of a dado is liked, because it gives an apparent stability to the wall by making its lower portion dark, and because furniture is invariably much improved by being seen against a dark background. The dado need not be plain; on the contrary, it may be enriched to any extent. It may be plain, with a bordering separating it from the wall; or it may have a simple flower regularly dispersed over it; or it may be covered with a geometrical repeating pattern, — in either of which cases it should have a border; or it may be enriched with a specially designed piece of ornament.

If the dado is enriched with ornament, and the cornice is colored, and a pattern is repeated upon the ceiling, the walls may be plain if they are of soft colors, or they may be covered with a simple “powdering.”

If a room is high, a bordering may run round the upper portion of the wall about three to four inches below the cornice.

Walls in middle-class houses are usually papered. This universal custom is not objectionable; but the paper should be so put on as not to show the joinings. The paper should be cut to the pattern and not in straight lines. Paper for walls should be used artistically, and not as paper.

As to the nature of the pattern which a wall-paper should have, it is almost impossible to speak, as there are endless varieties; but as a rule, it may be

said that those patterns made up of small, simple, repeated parts, which are low-toned or neutral in color, are the best. Most wall-paper patterns are larger than is desirable. The pattern can scarcely be too simple, and it should in all cases consist of flat ornament.

If the ornament is very good, and the pattern is the work of a true artist, it may be larger, for then the parts will be balanced and harmonized in a manner that could not be expected from a less skilful hand; but even if by the most talented designer, it must be remembered that he has designed it at random, and not as a suitable decoration for any particular room. The man who selects the pattern for a particular wall must choose that which is suitable to the special case.

The best wall-paper patterns are those which consist of somewhat strong colors in very small masses, — so small, in fact, that the general effect of the paper is rich, low-toned, and neutral, and yet has a glowing color-bloom; but these are rarely met with.

Respecting the coloring of cornices, a few words should be said. 1. They may be painted in bright colors. 2. As a rule, get red in shadow or in shade; blue on flat or hollow surfaces, especially those that recede from the eye, and yellow on rounded advancing members. 3. Use for red either vermilion or carmine; for blue, ultramarine, either pure or with white; for yellow, middle or orange chrome, diluted with white. 4. Use red very sparingly, blue abundantly, and pale yellow in medium quantity.

XII.

WATER-COLOR PAINTING.

WATER-COLORS in the present day are very different from the tinted and washed drawings of earlier times. Instead of being called drawing in water-colors the process has received the higher name of water-color painting.

The colors no longer simply wash the surface of the paper, but in many instances they so saturate the paper as really to become a part of it. Care must be taken to use such colors only as are known to be durable. Water-colors are admirably adapted for the representation of atmosphere under any conditions ; for middle distance also they compete successfully with oil-colors, but for foregrounds and foliage they can never attain to the same depth and power, and be accompanied with the same minute detail.

To obtain depth and power in the lightest tones of finished works, a single color is not sufficient ; it is necessary to repeat the washings-on and washings-off in order that the tint may become granular like the surface of the paper.

It is from this peculiar grain of the surface that the eye rather looks into it than upon it, receiving an impression of space rather than of definite distance, and in this respect water-color has a decided advantage over oil painting. In the former, a literal rendering of objects in the foreground, particularly of trees and herbage, is seldom attempted, generalization and sentiment being more suited to this style of art.

There is no effect of which water-color is not capable, whether of power or of delicacy, intensity, or purity. Being equally adapted to figure painting and landscape, it will faithfully fulfil the dictate of the artist's will, and become an instructive, perfect, and permanent work.

There are principles which do not really concern water-color painting, but as they are in every sense so connected with it that it must have recourse to them, it seems necessary to notice them here.

FORM.

Beauty and symmetry of form are dependent more upon curved than upon straight lines : in the former the eye perceives a deviation without disturbance, and therefore they are in consonance with the feelings, while in the latter at every angle produced it receives a certain check, and is consequently affected.

As form is the construction of nature, so is color the expression of it, and both are in a measure dependent upon each other. To say that sentiment cannot be portrayed by form would be untrue, as character can be expressed by lines of some sort or other ; but the veritable representation and perfection of sentiment can only be completely rendered by color, whether gay or sombre.

COMPOSITION.

The leading idea and unity of purpose, so essential both to the poem and the picture, must be strictly observed.

In landscape painting the picture may be described as being that portion of nature visible at one time and from one spot.

The first studies of composition should be faithful transcripts of the lines as they appear in nature. Subjects having simple forms should be selected, and from these no deviation should be permitted ; by this practice the mind becomes stored with images so clear and distinct as never to be forgotten, simplicity of parts and lines being at all times necessary to produce repose. After a little practice in composition, the student will become aware that lines receding from the foreground or base line of the picture, assist the perspective, and lead to a true estimation of the distance of objects, while those parallel to it only carry the eye from one side to the other. A road, a path, or a river may serve to increase the interest by conducting the eye into space, and by directing the attention towards the distance, or the special points of the subject. Any position in which the ruts of a road run perpendicularly from the base-line should be changed for one which will make them incline either to the right or left.

The terminations of promontories must be varied so that they may not appear to be exactly under one another, — an error of position to be avoided. One attractive element may successfully balance another of a different character. The horizon line is of the greatest importance, and it should always indicate the height of the eye. The point of sight should be placed more or less to the right or left in the picture. In regard to distance, only one portion of a landscape is in the proper focus to be seen distinctly at one time ; yet, as all the objects represented in a picture are placed at the same actual distance from the eye, we should select such a spot in the natural view as we desire to render most attractive in the drawing ; then, assuming that particular spot to be our focus, the other parts should be rendered more or less apparent, by being more or less finished in proportion as their distance from that point increases ; in this way the eye will be led to dwell on the most important point. Lines should be arranged and modified in such a manner as to keep the eye from wandering out of the picture.

Simplicity in arranging points of interest should be the chief aim ; one object should never be placed over another, if intended to be of the same size and to have effect ; neither should two objects of the same size and interest be so placed as to appear one on each side of some middle object.

The form of a picture must not be exactly square. The effect of height in lofty objects, as a near view of a cathedral tower or a mountain peak, is often aided by an upright form.

LIGHT AND SHADE.

There is an evident tendency in nature towards one spot of bright light, and one portion of shadow or concentrated dark ; and when, in a picture, these are in opposition, a greater and more brilliant effect is the result. The light portions of objects should, in art as in nature, first attract the attention ; after this, perhaps, the extreme darks, such as cast shadows ; then the larger masses of half lights and half darks. The form and distribution of the masses of light are of primary importance.

In practice, it will be necessary to study light and shade in two parts : first, the simple effect of every individual object ; then the general arrangement of the lights and darks, whether accidental or not. Objects nearest the eye have the most brilliant lights, the darkest shades, and the deepest shadow, all of which diminish in power as they recede from the eye ; to this degradation of power, white forms the only exception.

CAST SHADOWS,

Whether of individual objects in the picture, or of extended objects, as clouds, out of the line of vision, are very useful in indicating the shape of the surface on which they are thrown, by defining more distinctly the undulation of the ground, by seeming to hide unnecessary or ugly forms, and by supporting the lines of the composition, where the outlines of the objects themselves are not sufficient for this purpose.

The aerial perspective of all receding roads, paths, or streams is greatly assisted by shadows thrown across them.

The style in this branch of art, as in other branches, is dependent upon our appreciation of nature, upon the impression she conveys to us, and the manner in which we use our technical materials. Nature has no particular style ; she is perfect under every circumstance ; and the lessons which she gives the student will be differently received according to his perception and feeling. By some she will be most esteemed in detail, by others when generalized ; many will specially appreciate her forms, while others will become devotees at her shrine of color. It is well to copy from good works, but only as a help, to teach us to see and understand nature.

It must be remembered that the process of water-color painting is very different from that of oil painting, in which we begin with the colors of the shadows and shades ; while when painting in water-colors, we have to begin with the lights, and so work towards the darks and shadows. Pure colors are used only in a very small portion of any single object, or, indeed, of a whole picture, which is only in its primitive state so long as it is out of the influence of strong light, shadow, or reflection. When acted upon by either, it becomes changed, and assumes a different hue.

Both beauty and interest may be given to simple objects. The more unpretending the object, the more will our knowledge of nature and art be called into action. Good drawing, a beautiful disposition of line, truthfulness of coloring, with breadth of light and shadow, are necessary to render such

objects interesting ; for although the effect as a whole is harmonious, and the eye is impressed with a singleness of character as to color, yet upon a careful examination it will be found to possess almost every variety of tone and tint that can be brought together. Prettiness of execution is to be avoided, especially if made attractive for itself. The whole subject should be so represented that it will claim attention before the colors, the touches, or their handling.

If a building is to be introduced in the picture, it may in some cases be well to put in the first washes of it before attending to the sky, for the reason that we then see better where those lights fall that are indispensable to the subject. A scene must always be completely realized in imagination before it can be depicted upon the paper with any hope of success ; then, having the paper properly stretched, and all materials at hand that are required for finishing the sketch, an accurate and light outline in pencil should be made. A slight outline should be given to clouds, and their position should be correctly given as to altitude and size. Having completed the outline, before any tint or color be applied, the paper should be damped with water ; blotting-paper may be applied to remove the excess if time is an object.

Have the brush well charged with color, and begin at the top, either to the right or left, and before exhausting the contents of the brush take a fresh supply, and so continue till the whole space is covered. Instead of afterwards reducing the strength of color by softening with water, it is safer to work up to required strength by means of two or more repeated tints. (The brush must not be too full ; if so, the color separates from the water, and is so precipitated as to form dark spots upon the surface of the paper. Force of handling must be employed to make the tints lie evenly, and so prevent excess.) First, tint the entire surface ; second, turn the drawing upside-down, and begin with water, adding color by degrees until its full power is reached towards the top ; third, repeat the same process, but a little Chinese white may be added with advantage to obtain greater delicacy.

Should the first and second tints be unequally laid on, wash the whole with a brush and plain water ; and if this should be insufficient, use a soft piece of sponge transversely, so as to prevent any direction of line being formed. The sponge must never be employed until the first washing is given with a brush.

Where depth is combined with lightness, washing off with plain water will be attended with much benefit, as a very thin tint applied afterwards will renew strength, provided that the edges and outlines of the several washes always are preserved. This of course cannot be done out-of-doors, as tint upon tint must be put on rapidly, lest the effects to be rendered should pass away, and the opportunity be lost.

The colors once used should not be retouched until quite dry. In laying in the first tints of clouds, a certain degree of boldness is desirable, so that their forms may be left with well-defined edges, which are essential to their character as clouds. Great attention must be paid to the first tints at this

stage of the drawing. When dry, washes appear rather lighter and cooler than they did while wet ; they also lose by contrast with the more powerful colors in the foreground. When painting a sky, colors should be mixed in sufficient quantities to complete each tint. Distance sometimes must be blended with the sky ; if consisting of foliage only, it must be represented in masses, without any expression of detail. The character of the forms of distant mountains may be indicated by using a brush of medium size, with perhaps some thick cobalt, and dragging it at the side to express the several distances. It is a difficult operation, and it will be better to try it once or twice on a spare piece of paper before trying it upon the drawing. A warm tone may be given to those parts requiring it by washing them over with Naples yellow and rose madder.

In mountains, the first thing to be sought for is accuracy of outline. All mountain forms possess a greater or less dignity, while they at the same time have their own shapes and peculiarities. The whole is made up of parts ; each of these parts engages the attention of the eye and conveys a certain impression to the mind. The magnitude and vastness of mountain scenery is difficult to represent and is seldom successfully rendered.

In the representation of foliage, there is considerable difficulty in giving the idea of leaves, which of course is the chief thing to aim at. The great secret lies, without doubt, in the outside touch, and the distribution of lights between the branches. The shadows are put in by separate touches, with still thicker color than in the first washes, the brush being well lifted from the paper at every stroke, so that a certain crispness may be kept up throughout ; this must be done in treating clouds as well, but particularly in rendering foliage. Every touch must follow in the direction of the branch, and separate the light from the shadow.

Decision of touch, crispness of outline, and correctness of color, are necessities in tree painting. In trees we may consider three degrees of shadow after the first flat wash, — first, those which are broad leaving only the highest lights ; second, those which mark the general forms of shadow ; and third, those which consist of a few characteristic and deep touches. When rough paper is used, a little ox-gall will be found useful to make the touches take more easily ; but very little is required to effect this. For representing water or the general surface of water, the brush should be used horizontally, and for reflection perpendicularly. In all touches of dark color, as in the shadows of buildings, ruins, etc., the action of the hand should be quick and firm, the brush being lifted from the paper at each stroke ; attention to this will give transparency — a quality that is essential to shadow.

The middle distance is a very difficult portion of a picture to manage well. If the local color of objects begins to show itself in the endeavor to produce depth, atmosphere is lost, and if efforts be made to restore it the result is too often insipid and weak. The great secret lies in the avoidance of crude, harsh colors and lines ; nevertheless there must always be decision of form in everything, however faintly it may be given. So far as color is concerned it must be more or less broken, and mixed with the prevailing tone of the

atmosphere, whether in light or in shadow. Single washes will seldom effect this ; recourse must be had to frequent glazings in order to give depth and transparency ; for where light diminishes, transparency increases, — a fact generally overlooked.

The task to be accomplished in the foreground is to produce breadth, with repeated changes of color and multiplicity of form. The general effect should be aimed at, and at last a few deep touches or markings should be put in to give vigor and power. Life and action are entirely dependent upon figures, and by a judicious arrangement of them, and their suitability to the subject, a landscape, otherwise void of interest, is frequently made to assume a most beautiful and attractive character. Each subject should have that class of figures best adapted to it ; and each time of day should have a corresponding occupation, such as going to labor, laboring, and returning from labor ; each will thus have a particular tale to tell, and will have additional interest. Size and dimensions are also given by the introduction of figures ; they serve as a standard of comparison whereby every other object can be measured. Some scenes require a numerous assemblage, while others are unsuited to more than one figure, and that one contemplative. It matters little how many or how few the figures are, provided they are well adapted to the subject, and so placed that the general effect is enhanced by them. As regards color the chief requirement is that those colors should be selected which are suited to the general tone of the landscape, and that they should be placed in positions where power and concentration are needed.

Cattle also give a great charm to landscape scenery ; with figures they form most pleasing groups ; their colors are rich and dark, and their purity is thus enhanced. Flowers, fruit, and still life are good objects for the study of color, and possess the advantage of being procurable at almost any time.

Fine paintings of well-arranged groups of fruit and flowers have often a great charm, but they are of very little importance unless of great excellence.

A little skill in this class of subjects is not regarded, while the same skill or amount of knowledge in landscape painting is an unvarying source of pleasure, and often gives delight by recalling scenes which would be forgotten without pleasing mementoes in the form of sketches.

Earthenware, jars, and pitchers, grouped with drapery, wooden tubs, and other objects of still life, are the most choice subjects for the landscape student. The color and effect of light on those objects is very beautiful and offers great variety ; it is, moreover, of that kind which appears in a natural scene. One who is accustomed to make good sketches of such materials will find but little difficulty in the management of pigments when sketching out-of-doors. The art of disposing the folds of drapery forms a very considerable part of the painter's study. Carlo Maratta was of opinion that the disposition of drapery was even a more difficult art than that of drawing the human figure ; he thought that a student might be more easily taught the latter than the former, as the rules of drapery were, in his opinion, more difficult to ascertain than those for delineating a correct form.

To paint drapery as it happens to fall is a mechanical operation, which re-

quires neither genius nor taste, whereas the nicest judgment is required to dispose it so that the folds shall have an easy communication, and while gracefully following each other with such natural negligence as to look like the effect of chance, shall show the figure under them to the utmost advantage. It is well understood that great attention must be paid to our first studies; simple as objects may seem, if carefully studied, they can teach us much that will in future time be very useful, and prove sound foundation for any higher branch of art that we may enter upon.

XIII.

TEMPERA PAINTING.

THE original meaning and the accepted sense of the word "tempera," or its English equivalent, distemper, have already been given. In its original sense Milton so used it when he wrote, —

"I shall temper so
Justice with mercy as may illustrate most
Them fully satisfied and these appease."

The accepted sense of the word is purely technical, and to it alone are we to confine ourselves in this paper.

We find that real fresco painting is a very difficult art, and that the great masters sometimes finished in tempera what they began in fresco. Now, as the tendency to magnify our occupation is a natural one, it is not strange to find the term retained after the method was abandoned for the easier and surer, but less durable one of tempera. We talk of frescoing our rooms when we mean decorating them in tempera or distemper. Our fresco painters do not paint in fresco, *i. e.* upon fresh plaster, with water and lime as a medium, but upon dry walls, with glue-size or oil as a medium. We have been told (p. 21) the nature of the medium used in former times. That in most general use at the present time, for large work, is made from glue, an animal substance, obtained by boiling hides, hoofs, and tendons of animals. A gelatine obtained from fish is also used, and the vegetable gums — arabic, copal, shellac, sandarac, etc. — with which we are familiar. These are the principal substances used as mediums, which, when mixed with our ordinary pigments, are employed to produce works technically termed tempera or distemper paintings.

Having found, in our researches for light upon this topic, a volume of "quaint and curious lore," which reveals not only the technicalities of tempera, but also gives us glimpses of the inner life of the old masters, their religious enthusiasm and faith, their difficulties in preparation for the execution of their great works, we give some extracts from a work entitled "Treatise on Painting, written by Cennino Cennini, in 1437, first published in 1821, and translated by Mrs. Merrifield, in 1844," thinking they may be interesting if not profitable. The introduction to the first chapter commences :

"Here begins the book on the art, made and composed by Cennino de Calle, in the reverence of God and of the Virgin Mary, and of St. Eustachius, and of St. Francis, and of St. John the Baptist, and of St. Anthony of Padua, and generally of all the Saints of God, and in the reverence of Giotto of Taddeo, and of Agnolo, the masters of Cennino, and for the utility and good and advantage of those who would attain perfection in the arts."

Then follows an account of the creation and of the temptation and fall of Adam, in which the author is particular to put the blame upon Eve. He also tells how Adam had to earn his bread by digging, and Eve by spinning, and traces the successive development of the sciences and the arts. He crowns painting with poetry, and says: "To the painter is given liberty to compose a figure either upright or sitting, or half man, half horse, as he pleases, according to his fancy."

He then proceeds to tell us by what authority he speaks upon this great topic, in the following words:—

"I, Cennino, son of Andrea Cennini, born in the Calle di Valdelsa, was instructed in these arts for twelve years by Agnolo, son of Taddeo, of Florence, my master, who learned the art from Taddeo, his father, the godson of Giotto, whose disciple he had been for twenty-four years.

"This Giotto introduced the Greek manner of painting among the Latins and united it to the modern school, and the art became more perfect than it had ever been before. In order to assist all those who are desirous of acquiring this art, I shall make notes of all that was taught me by my master, Agnolo, and which I have proved by my own hands, invoking first the high omnipotent God, that is to say, the Father, Son, and Holy Spirit; secondly, that most delightful advocate of all sinners, the Virgin Mary, and St. Luke, the Evangelist, the first Christian painter, and my advocate, St. Eustachius, and generally all the saints, male and female, of Paradise. Amen."

Chapter IV is devoted to an enumeration of the things to be learned, under the two divisions of drawing and coloring. It tells first, how to grind colors; second, how to use glue; third, how to fasten cloth on the panel; fifth, how to prime with chalk; sixth, how to smooth the surface of the ground of the picture; seventh, how to polish it; eighth, how to make relievos in plaster; ninth, how to use bole; tenth, how to gild; eleventh, how to burnish; twelfth, how to temper colors; thirteenth, how to lay flat colors; fourteenth, how to powder a drawing; fifteenth, how to scrape; sixteenth, how to engrave gilding; seventeenth, how to rule lines, and how to color, to adorn, and to varnish pictures.

These items reveal to us some of the material difficulties under which the artist labored in those days,—difficulties which science and art, through the division of labor, have removed out of our path.

Chapter VII treats of the proper kind of bones for priming pictures. The author says, "For this purpose take the bones of the ribs and wings of fowls, and the older they are the better. When you find them under the table, put them into the fire; and when you see they are becoming whiter than ashes, take them out, and grind them well on the porphyry slab, and keep the powder for use."

The next fifty chapters are devoted to the preparation of paper and parchment, and to drawing from models and nature.

Then follow thirty chapters devoted to pigments and their preparation; brushes, and how to make them, which make the modern reader rejoice that Winsor and Newton live in our day.

In chapter LXX, which is headed "The Proportions of the Human Figure," Cennino says:—

"Before I proceed further, I will make you acquainted with the proportions of a man. I omit those of a woman because there is not one of them perfectly proportioned. The face is divided into three parts: the forehead one, the nose another, and from the nose to the chin a third; from the edge of the nose, the whole length of the eye, one part; from the corner of the eye to the ear, one part, etc. The length of a man is equal to his width with his arms extended. A man has on his left side one rib less than a woman. Men should be dark, women fair, etc. I shall not speak of irrational animals, as they appear to have no certain proportions. Draw them as frequently as you can, and you will ascertain for yourselves."

Part Fifth, Chapter CIV, thus opens with good advice as to patience in acquiring the art:—

"Know that you cannot learn to paint in less time than that which I shall name to you. In the first place you must study drawing for at least one year; then you must remain with a master in the workshop for the space of six years at least, that you may learn to grind the colors, boil glue, etc. etc. Afterward to practise coloring and paint on walls for six more years, drawing without intermission on holidays and workdays. By this means you will acquire experience. If you do otherwise, you will never attain perfection."

The next forty chapters are devoted to recipes for various kinds of glue, colors, etc. Then the author proceeds to tell how to color and to temper the colors, and says, "Now, by the grace of God, I should like to teach you to color pictures. You must know that painting is the proper employment of a gentleman, and that, with velvet on his back, he may paint what he pleases. It is true that pictures are painted in the same manner as fresco, with three exceptions: one is, that you must always paint the draperies and buildings before you paint the faces; the second is, that you must temper your colors with the yolk of egg, always putting as much of the yolk as of the color you would temper with it; third, that the colors must be ground very fine, like water (that is, to an impalpable powder)."

But we will not quote further. This treatise has revealed to us the methods of those early days as no other work we have met has done. Leaving the generalities and rhapsodies of most writers, the author takes us into his confidence and tells us the secrets of the trade, dropping expressions inadvertently which reveal the condition of civilization four hundred and fifty years ago,—revealing also that strong religious spirit which actuated the times. It closes with these words:—

"Praying that the most high God, our Lady, St. John, St. Luke the evangelist and painter, St. Eustachius, St. Francis, and St. Anthony of Padua,

may give us grace and strength to bear in peace the cares and labors of this world, and that to those who study this book, they will give grace to study it well and retain it, so that by the sweat of their brows they may live peaceably and maintain their families in this world with grace, and finally, in that which is to come, live with glory for ever and ever. Amen."

From the old world and the old masters, let us for a moment turn our thoughts to the new world and to living artists. We called a few days since upon Mr. McPherson, whose establishment on Tremont Street is well worth a visit, to learn how tempera painting is done at the present day. Mr. McPherson served his apprenticeship with Mr. Hay of Scotland, whose works upon color are standard authorities. When he came here, twenty-five years ago, he found but little demand for his services; but the progress has been rapid, till now, in busy times, he says he has a hundred and fifty men on his pay-roll, and that there is a demand for his services in all the large cities of the country.

In reply to the question how he would decorate the walls of a given room in tempera, in a private house, he said he should first have the owner select the furniture and carpets; then he would take into account the use for which the room was intended,—whether for a drawing, sitting, or dining room; then the aspect,—*i. e.* whether it had a northern or a southern exposure. Having as data the color and character of the furniture, the use and the aspect of the room, he studies to use such colors and designs as will blend and harmonize everything in it, and give it that cheerful, homelike air which is more easily comprehended and felt than described in words.

Behind the scenes of the Boston Theatre, amidst a wilderness of ropes, pulleys, trap-doors, etc., we found Mr. Getz, the scene-painter of that establishment; and, as with all artists and artisans, we found him very obliging, and apparently pleased to impart all the information in his power respecting his profession, in which he seemed an enthusiast. He said a good scene-painter must be master of landscape, portrait, figure, and historic painting; he must understand the laws of effects, and so design his scenes that when they serve as backgrounds to the forms of living actors they may be neutral and subdued, and not overpowering in their effect. Scene-painting is pure tempera,—perhaps the only pure tempera now practised.

XIV.

FRESCO PAINTING.

KEATS says, "A thing of beauty is a joy forever. Its loveliness increases; it will never pass into nothingness." And looking back over the centuries that have preceded this, we see the truth of the poet's words. Apparently impressed with the beauties of nature, man everywhere seeks to imitate, to the best of his ability, those beauties which he sees about him; and from the earliest ages to the present time has given evidence of his spirit of decoration. Upon the mummy-cases of the Egyptians we find picture writing combined with other decorations, and upon the walls of their temples and other buildings other evidences of their love of ornament are to be found. The Greeks, Etruscans, and Romans also have left us more or less perfect examples of their handiwork, while modern nations add their works as testimony to the universality of this love of the beautiful.

To the already mentioned practice of writing on and decorating the walls of tombs and buildings, we are indebted for a great part of our knowledge of ancient history and art; and from these and other ruins of times long past, it appears that the ancients were acquainted with several methods of painting upon wall surfaces, and had discovered that any coloring substance mixed with plaster while wet would remain in it when dry.

Whether this painting of the ancients is what is now known as true fresco, is questioned, and we have no satisfactory ancient authority upon the subject.

The term fresco is an Italian word, signifying fresh, and that method of painting has already been described (p. 20).

Mural paintings were executed upon plaster of various kinds, laid upon walls variously constructed, and several examples occur of frescos which were painted upon plaster laid upon lathing.

Mr. Charles H. Wilson, some years ago, was employed by the Commissioners of Fine Arts of England to collect information relating to the objects of the commission, and in his report he gives an account of the different kinds of walls appropriate for fresco painting, and describes its technical processes. Of painted walls, he says, "The oldest examples are to be found in Italian Gothic structures, such as the Church of Assisi and the Cathedrals of Orvieto and Siena." In the first of these churches there are numerous

specimens of the earliest application of the revived art of painting upon walls. In the others, instances also occur which, although less important, may be mentioned in illustration of the subject.

The interiors of the above-mentioned buildings are finished in fine masonry; the walls, externally and internally, have ashlar facings, with a heart of rubble. In some instances the walls are of marble, in others of stone, in others, again, of brick; but in every case the mere workmanship is very fine. When, at a subsequent period, the ashlar walls of these buildings were covered with paintings, one, or, at most, two very thin coats of plaster were laid on, — sometimes formed of lime and sand, at other times of lime and marble dust, — and the pictures were painted upon these grounds. They were, in most cases, commenced when the plaster was wet; but as, from its thinness, such plaster would dry very rapidly, the pictures were finished in distemper, and cannot be called frescos; and it may be inferred that this mixed art was a result of painting on coats of plaster, necessarily laid thin, as thicker coats would have destroyed the proportions of the building, which were already completed in stone or brick.

With the revival of classic taste a decline in constructive skill may be remarked, or, at least, the introduction of a very careless practice, namely, the retaining of the rubble and external ashlar facing, while the internal facing was done away with and plaster was substituted for it. Internal walls were frequently so built as not to be at right angles to each other, sometimes not perpendicular, and in all cases were very uneven on the surface, being generally built of mixed and indifferent materials, the fragments, apparently, of former buildings, such as small stones, broken bricks, and even bits of tile. Many fine works of art are painted upon walls built in this manner, and thus the inequality of their surfaces, which has been so often remarked and accounted for in so many ways, is readily explained. At times the inequality is increased, indeed, by the actual bulging of the intonaco, or last coat of plaster. This, again, is the result of bad workmanship, as in most cases no pains were taken to give the intonaco a key to the mortar beneath. Neither the Germans or Italians score or mark the plaster so as to give the intonaco or upper coat a hold, though the former use a precaution which is more effectual, namely, that of mixing coarse gravel with the first coats.

We find, then, that pictures were painted on three kinds of wall, — on the ashlar walls of Gothic edifices, on brick walls of buildings of different dates, and upon coarsely-built rubble walls of different kinds. To these are to be added frescos upon lath of which there are many examples in different parts of Italy.

The paintings upon ashlar walls do not appear to be as durable as those painted upon walls constructed in a different manner; the intonaco, although remaining fast to the first coat, often separates from the wall, the joints or seams between the stones not being open enough to give a good key to the plaster. In warm weather the moisture condenses on these walls and causes the plaster to fall away in large masses. Another source of injury to the plaster is that when the walls act as buttresses to resist the thrust of the

great transept arches, when the plaster falls off in large masses in the direction of the thrust. Examples of painting on this kind of wall may be seen in the Church of St. Francis at Assisi, the Chapel of the Sacrament at Orvieto, and in the Cathedral of Siena.

The pictures of Spinello Aretino in St. Miniato at Florence are specimens of an early date and in perfect preservation; these are upon brick walls which are evidently dry, and being well built, the surface of the paintings is even; thus they are not injured by dust settling upon them. This kind of wall appears to be the best for painting, for in nearly every case examined by Mr. Wilson he says, "The pictures upon brick walls were in an excellent state of preservation." The picture by Giotto in the Chapel of the Scrovegni, the paintings in the library of the Cathedral of Siena; the frescos of the later Florentine masters in the cloisters of several of the convents in Florence, and of a later date the numerous frescos of the Carracci and their scholars, may be instanced as proving the durability of fresco; all are on brick, and in all the plastering is excellent. To the above may be added the frescoed ceilings at Genoa; nearly all are on brick vaults, and nearly all in perfect preservation.

Unfortunately some of the most precious works of the great masters are upon rubble walls, and to this their dilapidated state is in a great measure to be attributed.

There are instances of such extensive ruin that the cause of the unevenness of the frescos is evident, and it is probable that the same effect invariably proceeds from the same cause. It is quite out of the question to suppose that the wall behind frescos painted upon solid but uneven surfaces, can be ashlar, nor are they likely to be brick, as examples which are certainly painted upon plaster laid upon brick are quite even on the surface; and the external facings of brick in walls where these uneven frescos are found, are perfectly even. Neither does the unevenness in every case proceed from the bulging of the intonaco, — which is easily detected by tapping it with the finger, — for frescos may be very uneven on the surface and yet quite solid. In the chapel of Saint Cecilia at Bologna, the frescos by Francia and Costa are unhappily so much injured that the wall can be seen in several places. It is evidently of the coarsest rubble construction, and the frescos are very uneven on the surface.

The walls of Santa Maria Novello at Florence, and other churches and buildings at Padua, Venice, and other places, have all very uneven surfaces, and all have consequently suffered from the accumulation of dust upon the inequalities, as well as from the cracking and breaking off of the plaster, partly owing to the bad masonry and partly to the careless way in which the mortar was applied. Where such remarkable carelessness as to the quality of the masonry is recognized, instead of being surprised at the present state of the frescos we ought rather to wonder that they are preserved at all. Wherever due attention has been paid to the construction of the walls, the pictures upon them are in an excellent state of preservation, or their dilapidation can be accounted for from external causes which might have been guarded against.

Vitruvius gives minute directions for the construction of roofs and ceilings, and the composition and manner of plastering; and Pliny praises the stucco, which consisted of three coats of lime and sand and two coats of lime and marble dust. The lime for these coats of plaster was prepared with the greatest care, and was steeped or slaked in water for a number of years; it was also mixed with milk, which gave it more consistency, and produced a more mellow white color.

Alberti, in 1452, describes the same number of coats, and says that the lime is not mature in less than three months; he had seen lime, and in considerable quantity, which had been abandoned, as he had good reason to believe, for more than five hundred years, and yet, when discovered, it was found to be moist and liquid, and, as it were, so ripe that in its consistency it far surpassed honey and marrow. He adds: "If you use it thus, it requires double the quantity of sand."

Andrea Pozzo (1642-1709) describes a similar method of preparing the wall, and says that the mortar should be laid on by an expert and active mason, in order that the intonaco may be spread evenly, and that the painter may have sufficient time to paint upon it during the whole of that day.

Palomino (1663-1726) gives for the proportions of the stucco equal proportions of lime and sand, and adds, "But if the lime has been rendered mild by time, the proportions should be three parts of lime to one of sand,"—just the opposite of Alberti's recommendations.

The earliest modern writer whose work has been preserved is Theophilus, a monk, who is supposed to have lived between the 9th and 13th centuries. Other writers on the subject of fresco painting are Cennini, 1437; Alberti, 1485; Vasari, 1547; Guevara, 1550-1559; Borghini, 1584; Armenini, 1587; Cespedes, 1608; Pacheco, 1641; Pozzo, 1693-1702; Palomino, 1715-1724; Mengs, 1779. Commencing, therefore, with Theophilus, the above series embraces the periods of its commencement, progress, and decline.

Between the period when Cennini wrote his treatise and the publication of the work of Vasari, the art had advanced rapidly. Leonardo da Vinci, Michelangelo, Raphael, and Correggio had lived and died. The Sistine Chapel, the Vatican, and the Duomo of Parma had been painted, and the processes of fresco painting had been changed in some important points.

The practice of indenting the plaster with the point or stylus (see page 20) is very ancient, and we find that the figures painted in Etruscan tombs were outlined in this manner; that is, the point was used to mark the external outline of the figure only. It was employed by the early masters on the revival of art in Italy, precisely in the same way, in outlining their works in distemper on panels. Thus Giotto and his followers drew, and we find the same practice followed in the Sieneese school, with a singular exception, which is that the figure of the Madonna is entirely marked in with the stylus; that is, not merely the external outline, but the outline of the folds in the drapery. A notice of this practice, confined to the school of Siena, is useful, as it establishes a clear distinction between the early pictures of that school and those of contemporary Florentine masters.

It is very remarkable that, whilst the point was used in distemper pictures on panel, it rarely was in those of the same period on walls. It is never found in mural paintings by Cimabue, Giotto, Orgagna, or Benozzo Gozzoli, but was employed by Fra Angelico, in the architectural backgrounds only of those in the chapel of Nicholas V, in the Vatican.

Perugino pounced all his outlines, as did his great pupil Raphael ; but his pupils, again, followed each his own fancy in this respect. Raphael did not, however, use the point in his fine works in the Farnesina, and the advantage is obvious : for whilst its convenience makes it very useful in works at a considerable distance from the spectator, it never should be seen in those which are nearer to the eye, especially if the light falls full upon them.

In studying the art of fresco painting, it is necessary to consult the works of the old masters for examples of execution ; and in these we shall find as much diversity of touch and handling and as many styles as may be observed in the works of the same artists in oil, and at the same time every quality of execution possible in oil painting, although in different degrees. "We have transparency, opacity, richness ; we have thin and thick painting, even to loading, and that to an extent that cannot be contemplated in oil ; we have the calm, transparent painting of the Florentines, the rich variety of the Venetians, and," says Wilson, "there are cases in which the well-nourished brush of Rembrandt seems represented in the works of the fresco painters of old Italian times."

In preparing the palette for fresco painting, the colors should be put into their proper cups or saucers, with a spoon for each ; the palette should be large enough to mix the tints with the brush without running them into each other, and more color than is required should be put on the palette at once, that the color may not dry too soon. The order to be observed is to put in the background or skies which are behind the figures, gradually approaching from them towards the figures in the foreground.

The selection of colors for painting in fresco is among the most important parts of the art. All the best authorities are unanimous in the opinion that the natural colors only are proper to be used in fresco painting. But although the natural colors are neither numerous nor brilliant, yet the frescos of Raphael, Michelangelo, and others satisfactorily prove that the colors used by them were amply sufficient for the purposes of fresco painting.

Some of these colors have fallen into disuse, and the knowledge of their value, application, and use is in a great measure lost. Artificial colors have for a long time been improperly substituted, and failed of their object, — the consequence being that the highest branch of the art of painting, and that from which the greatest masters derived most of their celebrity, has declined and fallen into disuse.

The old masters, it appears, used a natural color, which, when opposed to other colors, appeared like lake, and although mentioned in terms of praise by many writers on art, is called by different names. Cennini calls it *amatito*, and describes it as a very hard and fine stone, — so hard that tools are made of it to burnish gold on pictures. He recommends it to be ground

with clear water, and says the more ground the better, and describes the color as being that which cardinals wear, or a purple or lake color. Another author calls this color cinnabar, others matita. It is now considered that this was hematite, a species of iron ore.

Spanish authors speak of albin and pavonazzo as substitutes for carmine, and observe that pavonazzo was a degree lower in tone than albin.

Sinopia is another color mentioned, and is described by Pliny as a natural pigment, which derived its name from a place of the same name.

Among the blues, we find *cæruleum* or *vestorian azure*, — a kind of blue glass, described by Vitruvius and Pliny; *smalto*, *smaltino*, and another blue called "*azzurro della magna*," which was expensive, and is by some early authors supposed to be cobalt or ultramarine, but later writers speak of it as a different pigment, because cobalt is not so easily obtained, and ultramarine is by some not considered suitable for true fresco.

The employment of green colors in fresco is less difficult than blues, as green is easily made by a mixture of blue and yellow; and blues have a tendency to become green. The green pigments used in fresco are *terra verde*, *mountain green*, and *lapis armenus*.

Black colors are among those that are found to be the least durable in fresco, and as the color hardly exists in nature, it should rarely be used.

The finest white was called *Bianca Sangiovanni*, and was composed of lime carefully prepared; another white was calcined *travertine*.

Pozzo gives a list of colors which he considers best for fresco, among which he speaks of white made from lime, after being slaked at least for six months. "White from Carrara marble is good, but it is useless to prepare it," he says, "when well-seasoned lime and egg-shells can be obtained. Vermilion is a most lively color, but must be prepared with lime-water." Other authors object to this color.

Burnt Roman *vitriol* succeeds well with lime when ground with spirits of wine, and is very useful as a ground for vermilion. When both are used in drapery, they produce a color quite equal to that of lake in oil painting.

Red ochre, like all the other earths, is most excellent for fresco. Burnt yellow ochre is rather a pale red, and is used for shading yellow draperies. There are two kinds of yellow ochre found at Rome, one light and the other dark.

Brown umber is good for shades of draperies. It must be used with care, and mixed with white lime, because it always becomes darker and increases in depth.

Burnt umber is excellent for shades of carnations when mixed with Venetian *terra vera*, or black earth, which is the darkest color of all for fresco painting.

Charcoal black can be made in various ways, and is good for anything for which black is required, although Roman black earth produces the same effect, and is in very general use.

Smaltino, or glass blue, should be laid on before the other colors, while the *intonaco* is still wet, for otherwise it will not incorporate with it. An

hour after the first coat has been applied, a second coat must be laid on to make the color deeper. The pure color will serve for shades, but charcoal black should be used in the deeper shades.

All the above-mentioned colors must be mixed with lime-white to produce the light and middle tints.

Some writers affirm that ultramarine is not good for fresco, but Pozzo considers it as good in the true fresco as in the dry, but says it is not used, as it is of such great value. He also says that indigo may be used in summer, but not in winter ; while others say that this color is destroyed by wet lime.

In all these colors, particular care should be taken that they are the very best of the kind, — the brightest, purest, and finest that can be obtained, — keeping them clean to preserve their brightness.

It was the practice of many of the old masters to retouch their frescos when dry, and to lay in preparatory tints totally different from those intended to be used in finishing ; thus, a dark-red color was almost invariably laid in as a preparation for blue, and this practice was generally adhered to until after the time of Raphael. In some cases, it is very easy to detect this retouching, for it will generally be found to be somewhat darker than the painting around.

On this subject, however, no better advice can probably be given than that given by Borghini, who says, "Therefore, whoever paints in fresco should each day completely finish his day's work without having to retouch it in secco, because his picture will be of longer duration, and he will be considered a better master."

XV.

OIL PAINTING.

ALL writers are agreed that oil painting, as practised in modern times, was first introduced about the year 1410, and the honor of its invention unquestionably belongs to the brothers Hubert and John Van Eyck, two Flemish painters, who seem to have lived both at Ghent and at Bruges. John was buried at the latter place, and at the beginning of the 17th century a monument to Hubert was still in existence in the Church of St. John, which is now the cathedral at Ghent.

The chief honor of its introduction is probably due to Hubert, the elder of the two, but the great, if not superior, merit of the younger brother, and the fact that his works only were known in Italy, have caused the name of John Van Eyck to be most commonly associated with the invention. It was probably rather the excellence of their work than any technical process which they had discovered, that recommended their method to the world; and we have to thank them less for inventing a new process, than for showing by their skill what were the capabilities of an art that had waited for centuries for the hand that could apply it. But before we proceed to examine the nature of their discoveries or improvements, let us first glance at the previous history of painting, at least at so much of it as is most nearly connected with our subject.

The pictures of the ancients were executed either in tempera or in encaustic, and were painted (if not upon the walls of buildings) either on ivory or on wood. The processes of tempera painting have been so fully described in the preceding pages that nothing more need be said about them here. The different methods of encaustic painting have been also so clearly described in Mr. Perkins's able and instructive lecture (p. 25, *et seq.*) that your attention is called to them for a few moments only to point out the relation between this ancient art and the earliest use of oil, in connection with painting, with which we are acquainted.

The third method, spoken of by Pliny (see p. 25), brings us to the still open question regarding these wax colors that could be applied with a brush. How were they retained in this liquid state? By a fixed oil, such as linseed, nut, or poppy? By some one of the essential oils, as turpentine? or by some kind of lye which reduced them to a soapy state, so that they might be diluted with water? Perhaps all three of these methods were used. The first

two are so intimately connected with our subject as to be deserving of some attention, for much of what we call oil painting is really done either with varnish or with wax, this latter having been much more freely used than is generally supposed. It has been found, by analysis, that the colors of the Egyptian mummy-cloths were mixed with wax, and the art has never been wholly lost sight of: it has been retained for ages in the traditional practices of the monks of Mt. Athos, where it is still practised, and has been revived in different forms in quite modern times and by distinguished painters. Some of Sir Joshua Reynolds's most beautiful pictures, noticeably "The Little Strawberry Girl," so familiar to us through engravings, are painted not in oil but in wax, dissolved in Venice turpentine, as shown by his own note-book.

Another practice of the ancients, which is still more intimately connected with our subject, was the use of resinous varnishes, which, from a very early period, were applied to their pictures, whether executed in tempera or encaustic; and it is more than probable that from the use of these varnishes the practice of oil painting was gradually developed. This varnish of the Greeks was composed of gum, mastic, and wax; but we are still uninformed of the vehicle that must have been used in applying them, for the nature of both is such that some fluid—which may have been either turpentine or oil—must have been used to dissolve and dry them.

Now, some of the drying oils, as nut oil and poppy oil, were known to the ancients, as is shown by the works of their writers on medicine; and as resins, such as sandarac, copal, and gum-mastic, dissolved in drying oils, had, for many centuries before the invention of modern oil painting, been employed to protect pictures, "it is quite conceivable," says Sir Charles Eastlake, "that a practice which was common among the Byzantine artists might have been derived, as many of their processes were, from the technical methods of the best ages of Greece."

But my object in this inquiry is not to prove the antiquity of any process or art, but to trace the steps by which this art arose; and I have attached so much importance to this old varnish of the Greeks because it seems to be the prototype of the oleo-resinous varnishes of the Middle Ages, which, being gradually adopted as a vehicle as well as a varnish, have taken so conspicuous a place in the history of painting.

The resinous varnish employed by the early Christian painters was quite dark and quite thick, so that its application produced a decided modification of the painting to which it was applied, and the artist had to paint in very fresh colors, with a view to the mellowing which this strong glazing—for this it really was—would produce. Flesh color, for instance, was painted of a greenish hue, which was neutralized by the dark red of the varnish. This dark color was so far from being thought objectionable that when the painter substituted—as he sometimes did—a varnish prepared with whites of eggs, it was colored in imitation of the dark resinous varnish.

It is quite probable, therefore, that the painter, seeing how the tint of his varnish affected the hues over which it was placed, would vary that tint so as to heighten the effect of his picture. The next step would be to treat the

tempera picture still more as a preparation, and to calculate still further on the varnish by modifying and adapting its color to a greater extent. A work so completed must have nearly approached the appearance of an oil picture ; and, fortunately, there is preserved at Villeneuve a picture by King René of Anjou, which exhibits just this stage of the art. From this use of transparent colors with the varnish, the step was an easy one to the use of opaque colors as well, these last being applied to the lighter, as the former were to the darker parts of the work.

I ought, perhaps, to have mentioned before, that while, by these almost imperceptible changes, what was before only a varnish came to be adopted as a vehicle, its dark color became more and more objectionable. Methods for bleaching it had been to a considerable extent successful, and, by increasing the proportion of oil which was employed, the objection was in a great measure removed ; but it never has been wholly so even to our own day, the purest oil itself having a decided tendency to turn yellow, to say nothing of the varnish, which is always present in a greater or less degree.

But though the Flemish school of painting seems thus to have arisen through the use of oil in varnishes, it must not be supposed that this was the beginning of its use in the preparation of colors, though it was undoubtedly the beginning of its successful employment for the purposes of fine art. Methods of bleaching and thickening linseed oil by exposure to the sun, either in a pure state or mixed with certain pigments, such as white lead, to increase its drying properties, had been in use for centuries before the Van Eycks ; and this thickened oil — which was almost identical with the fat oil which is the best material for gilding known to the decorators of our own day — was used either as a varnish, being highly recommended in an old MS. as a useful dressing for pictures, cross-bows, etc., or as a vehicle for color. Painting with this clumsy medium, which seems to have been valued chiefly on account of its glossiness, must have been quite extensively practised in the northern countries of Europe, particularly in England, certainly in the twelfth century, and perhaps long before. But however extensively employed in certain coarse kinds of decoration, it was still entirely unfit for the purposes of fine art ; and although it was sometimes introduced into pictures, it was only partially employed in the purely decorative parts, while the more delicate work, as the flesh in the figures, had still to be executed in tempera. Although some improvements in its preparation were doubtless introduced, and although Giotto is said to have sometimes painted in oils, there are no certain examples of pictures painted before the fifteenth century in which the flesh is executed in oil colors.

The principal objection to the use of tempera seems to have been the difficulty of blending the tints on account of the quick drying properties of the vehicle, so that hatching had constantly to be resorted to ; but this difficulty was certainly surmounted by some painters by the use of honey, wax, or some such ingredient, which retarded their drying properties, and allowed the tints to be so blended in such a manner that no appearance of hatching is to be detected in their work.

But with all its imperfections tempera was still preferable to oil painting

before the improvements of Van Eyck ; and even after these were introduced many of the best Italian masters remained for a long time faithful to their earlier habits. Michelangelo was never converted. Indeed, the very facility with which the colors could be manipulated by employing the new method, seems to have retarded rather than to have hastened its general adoption, by tempting the painter into minuteness of detail, even to a real littleness of manner, and to amuse himself with subtile trickeries of color to the neglect of the higher qualities of composition. This objection — which, of course, is chargeable not to the method itself, but to the practice of the Flemish painters through whose work it was first introduced to the Italians — has appeared so important to the minds of the greatest masters that no doubt the history of the grandest things that have ever been done in art is the history of tempera and fresco. Perugino, Leonardo, and John Bellini succeeded in adapting oil painting to large dimensions, and in many cases to a corresponding breadth of manner, and their immediate followers carried the art to perfection. In his beautiful “*Lectures on Art*,” Ruskin thus alludes to the age of these painters and to their successors : “*I have ventured*,” he says, “*to call the era of painting represented by John Bellini, the time of the masters. Truly they deserved the name, who did nothing but what was lovely, and taught only what was right ; these mightier who succeeded them crowned, but closed, the dynasties of art, and since their day painting has never flourished more.*”

The improvements introduced by the Van Eycks seem to have consisted chiefly in the discovery that oil-varnishes could be used as vehicles thin enough to admit of very delicate manipulation, and still retain the gloss which was prized so highly.

The student who is curious about the methods of preparing the oils, varnishes, etc., in use among the painters at this time, may consult with advantage the valuable work by Sir Charles Eastlake, which he has called “*Materials for a History of Oil Painting*” ; but the investigation of these details has seemed to be no part of our present task. Our materials are now selected and prepared for us in a manner which we could not by ourselves hope to excel, each color being ground in the oil best fitted for it, and preserved in a form as neat and convenient as the preparation of the color has been careful and complete. This is also true of varnishes and mediums, and though in the use of them we cannot exercise too much care and discrimination, yet their mechanical preparation is substantially taken out of our hands.

We come now to an examination of the technical methods which have been employed by the different masters and in different times. Perhaps the only technical process which has survived without change from remote antiquity is a method of preparing grounds on wood or other surfaces. The layer of chalk and size which is found under the colors upon Egyptian mummy-cases is nearly if not quite the same as that employed by the painters of the Middle Ages, and it has been more or less in use even to the present day. This preparation, the solid ingredient of which may be either chalk or plaster of Paris, finely ground and mixed with water, is fittest for an unyielding surface, as it becomes brittle with age ; and it is to be observed that the early Flemish masters worked almost exclusively on wooden panels in which they were

followed by Rubens, who preferred, at least in his smaller pictures, panels prepared with smooth and delicate plaster grounds.

The Venetians, however, seem to have from the first preferred cloth of fine texture, over which this plaster ground was spread as thinly as possible, so as to avoid the danger of its cracking when the picture was rolled. But the use of wooden panels, large or small, must have been very common in Italy as well as in the northern countries. Raphael's Transfiguration was painted on a panel composed of planks three or four inches thick; and if a picture is thinly painted, as they generally were in the early Flemish school, and even by Rubens, it is much less liable to change if painted on wood than on cloth, as in the latter case it is exposed to the action of the air, damp, and even dust on both sides.

The ground for these panel pictures was prepared in this way: the wood, which was not to be too smooth, was prepared for the plaster by two or three coats of size; and by size, I suppose we may understand either the mixture prepared with whites of eggs or any other of the glutinous vehicles employed in tempera painting. Over this the plaster, mixed with a strong size, was applied. When this was quite dry it was scraped until perfectly smooth, and on this delicate ground the drawing was made, whether traced from a cartoon or sketched in charcoal, and afterwards fixed with a brownish ink and shaded like a drawing. It was in just such a manner that pictures in tempera were begun; and we thus see how easily the two methods might have been combined, as they were in such examples of the art of the fourteenth century as have been alluded to before, in which the flesh was painted in tempera and the draperies in oil. Over this drawing a transparent warm tint in oil was spread. I say "in oil," but it must not be forgotten that in the early Flemish practice the medium or vehicle was always more or less oleo-resinous, that is, an oil-varnish. Over this priming, when quite dry, the shadows were painted in with a transparent brown, using the resinous vehicle quite thickly, the half tints being also more or less indicated, so that the work was then tolerably complete as to its light and shade. The lights, though painted in opaque colors, were yet so thinly executed as to preserve the bright ground beneath, so that in the early Flemish works the shadows are uniformly more raised than the lights. Sometimes the light, warm tint which was usually passed over the drawing was omitted, and then the picture may have been executed at once upon the white ground, this being merely covered with a transparent size.

The habits of the first oil painters were in many circumstances influenced by the practice of tempera, and in both methods it was common to finish the work as they proceeded with it, a part being completed while the rest remained untouched. In this, as in many other respects, the practice of the Flemish painters corresponded to that of the Italians, for they both learned very early that each color, to remain pure and unchanged, must be put into its place at once, and not be disturbed afterwards. This lesson we cannot learn too soon nor follow too closely.

Although in many of the works of the best painters, as, for instance, the portraits of Vandyke, the colors were worked over one another, and yet the

whole completed at once, we are quite certain that they were able to do this only by using a quick-drying varnish for a vehicle, so that the colors "set," as it is called, almost as soon as they were applied ; and the sharpness, which is so remarkable in well-preserved Venetian pictures, seems to be due to a similar quick-drying vehicle which must have been applied in a decidedly thin state.

The practice of the Italian painters, as of the later Flemish ones, seems to have differed from the earlier, chiefly in that they learned to load the lights more freely, and to depend less on the bright background for the light in their pictures. It seems to have been reserved for the great Venetians to show that shadow is not absence of color, but, on the contrary, necessary to the full effect of color ; and the great splendor of the Venetian school arises from its painters having seen and held from the beginning this great fact, — that shadow is as much color as light, often much more. It is not enough that shadow shall be transparent ; indeed, according to the common acceptance of the word, it can hardly be said to be desirable except in quite exceptional cases. Ruskin says, "After many years' study of the various results of fresco and oil painting in Italy, and of body and of transparent color in England, I am now entirely convinced that the greatest things that are to be done in art must be done in dead color. The habit of depending on varnish upon lucid tints for transparency, makes the painter comparatively lose sight of the nobler translucence which is obtained by breaking various colors amidst each other. And even when, as by Correggio, exquisite play of hue is joined with exquisite transparency, the delight in the depth almost always leads the painter into mean and false *chiaro-oscuro* ; it leads him to like dark backgrounds instead of luminous ones, and to enjoy, in general, quality of color more than grandeur of composition, and confined light more than open sunshine, so that the really greatest thoughts of the greatest men have always, as far as I remember, been reached in dead color, and the noblest oil pictures of Tintoret and Veronese are those which are likest frescos."

The use of oils in painting, though attended with limitations and imperfections, is yet a favorite method with the painters and the public of our own day ; and certainly for such forms of art as are best suited to the temper of our times, it seems to be eminently fitted, for many and sufficient reasons already explained to us. Noble work in fresco, it is supposed, is quite impossible to the age in which we live. Tempera is still used in the decoration of large surfaces to a considerable extent ; but in private edifices, where the work is to be seen comparatively near, and in which, therefore, some delicacy of execution is desirable, oil is usually preferred. For some landscape subjects, and for many methods of study, water-color is for many reasons to be preferred ; its neatness and convenience, and the comparative ease with which certain delicate effects of light and distance can be attained by its use, must constantly recommend it to the sketcher. But for pictures in which truthful representations of texture, such as flesh and draperies, are especially desirable, as well as for rendering the more precious subtleties of color, the excellence of an oil medium seems to be quite undisputed, and it must still be accorded one of the highest places in modern art.

XVI.

TECHNICAL TERMS.

Accessories. Any objects not actually belonging to the main subject of a picture.

Accident is a special condition or aspect of an object or collection of objects, as distinguished from a general condition or aspect of the same.

Aërial. A gradual weakening of the tones of colors as they recede from the eye.

Arrangement is the combination or distribution of the various elements of a picture.

Bearing out is using color in its full force. In opposition to sinking in.

Breadth is effect, resulting from the general treatment of a subject, in which details are subordinated by grouping them in masses to produce simplicity of effect.

Cartoons. Designs upon paper prepared by painters, from which their works are to be executed.

Cast shadow is that which is produced upon a surface by the interposition of an opaque body between it and the light.

Chiaro-oscuro. The art of distributing the lights and shadows of an object so as to give it a natural effect.

Composition includes *arrangement* with *invention*.

Contrast is the opposition of different colors and shades of color, to each other.

Cross hatching is the use of the wet or dry point, as in a line engraving, to make lines which cross each other at regular distances, and cover only a part of the ground.

Dead coloring is the preparatory painting, cold and pale, to admit of after-glazing, etc.

Design implies the representation of objects, human figures, or animals, and includes correctness, style, variety, and perspective, outline, measure, and proportion.

Dragging is the process of drawing a brush charged with thick opaque color heavily and quickly over the painting.

Finish is perfect expression of detail without sacrificing breadth.

Foreshortening is the apparent diminution of the length of an object in

proportion as the direction of its length coincides with the direction of the visual ray.

Glazing is putting a transparent color over other colors, either to increase or decrease their brightness, without changing their effect of light and shade.

Handling, when applied to manipulation, means the method of using the means employed for representing objects. The handling of a subject means the treatment of the incident or theme.

Harmony is the placing of three or more colors in the same proportions as to surface as they exist in white light, or is the effect of a proper arrangement of colors in a picture.

Hue is the predominance of a primary in a compound.

Impasting is the loading of opaque color upon the lights.

Keeping is the proper subserviency of tone and color in every part of a picture.

Laying in a flat wash is the even covering of a surface by means of a brush fully charged with color diluted in water.

Light is the illuminated portion of an object giving direct reflection.

Local color is the color of any part of a picture or group of objects or subjects,—the self-color of an object, unchanged by light, shade, distance, or reflection.

Manner. Habit of handling, coloring, inventing, etc.

Motive. The subject matter of a single figure or group.

Oiling out is the preparatory process of spreading a coat of oil upon a surface which will unite with it and receive the upper coat of paint.

Point. The brush is described as the wet point; the pencil or crayon as the dry.

Priming. The laying of a preparatory ground without reference to color.

Reflected light is the indirect illumination of shadow.

Relief in painting is the apparent projection of a shaded representation of an object from a flat surface.

Scumbling is the process of passing a thin film of opaque color over other color in a nearly dry condition, so as not completely to cover the color worked over.

Shade is the partial obstruction of light.

Shadow is the obstruction of direct light.

Stippling is the process of using the wet or dry point in a series of touches, strokes, or dots, to obtain evenness of surface, gradation of shade, or intensity of shadow.

Style implies the way in which materials are used to convey conceptions and sentiments. Applied to subject as well as to mode of treatment.

Texture is the imitation of the surface of the object represented.

Tint is the dilution of a primary by white.

Tone is the degree of light and shade in some specific part of a picture,—harmony of shading or accord in hue, or the general effect produced by all the colors used.

XVII.

STRUCTURAL BOTANY.

STRUCTURAL BOTANY is the study of the form and structure of the organs or parts of a plant by which its functions are performed, and in beginning this study the question arises, How do plants grow?

To get a clear idea of the whole structure and growth of plants, let us begin with the seed, and trace from it the life of the plant through successive stages until we reach the seed again.

If we take a maple seed and lay it open, we can see, without the aid of a microscope, that the little plant already formed consists of a pair of very small leaves borne on a stem, and snugly packed within its protecting walls. Thus we see that the plant exists beforehand in the seed, and that in the process of germination it has only to burst its prison-house, unfold, and grow to push its leaflets upward into light and air, and at the same time to thrust its little stem deeper and deeper into the earth, to form the roots with which it is to draw its nourishment from the soil.

The little leaves of the seed have between them a minute bud of undeveloped leaves called the plumule. In some plants this does not appear for several days after the seed-leaves; in others it makes its appearance very soon as a pair of minute leaves raised on a stalk which carries them above the seed-leaves. Later, a third pair of leaves proceeding from the summit of the second is formed, and raised on a third joint of the stem, and so on until the plantlet becomes a tree. All this time the root is growing, but in a different manner; for while the stem is growing by joints, the root grows continuously from the bottom without joints.

Both root and stem generally branch, the root without any particular order, while the stem gives out regularly disposed branches which in their undeveloped state are called buds. These appear in the axils or angles formed by the leaf and stem on the upper side, and develop into branches in the same way that the plumule did from the embryo.

Herbs and trees grow in the same way, the difference is only in size and duration. The herb after ripening its seed, or at the approach of winter, dies altogether, or down to the ground, and is called an annual, biennial, or perennial herb, as it ripens its seed the first or second year, or as it lives and blossoms year after year, throwing out shoots from buds that survive.

A shrub is a perennial plant, with woody stem, which continues alive and grows year after year.

A tree differs from a shrub only in greater size.

Buds are terminal or axillary, according as they grow on the end of a branch or in the axils of the leaves. They are scaly or naked, the first being covered with scales, a kind of imperfect leaves to protect the parts underneath from injury, common to trees and shrubs in northern climates. Naked buds are usual in tropical climates as well as in herbs everywhere which branch during the summer, but cannot bear the winter.

Other names given to buds are accessory or supernumerary, adventitious that is out of the axils and without order and latent, when they survive long without growing.

Leaf-buds or flower-buds are so called because they contain leaves or flowers.

The arrangement of branches is the same as that of axillary buds and leaves, that is, opposite, when two leaves are borne on the same joint of the stem, or alternate, when there is only one from each joint.

Only one leaf is ever produced from the same joint. When two are borne on the same joint they are on opposite sides of the stem, that is, they are separated by half a circumference; when in whorls of three, four, or five, or any other number, they are equally distributed around the stem so that they have the greatest possible divergence from each other.

This arrangement of leaves around a branch is expressed by fractions, which denote the divergence of the successive leaves, *i. e.* the angle they form with each other; the numerator expresses the number of turns made around the stem in completing one cycle or set of leaves, and the denominator gives the number of leaves in each circle as $\frac{1}{2}$, $\frac{1}{3}$, $\frac{2}{5}$, $\frac{3}{8}$, $\frac{5}{13}$, in which the fourteenth leaf is over the first, after five turns around the stem the numerator and denominator of each fraction being those of the two next preceding ones added together. At this rate the next higher should be $\frac{8}{21}$, then $\frac{13}{34}$, and in fact just such cases are met with and commonly no others. The shapes of the leaves also should be attended to, and will be alluded to further on.

Inflorescence is governed by the same law as the arrangement of the leaves, for flowers are buds developed in a particular way, and flower-buds occupy the position of leaf-buds and no other; and as leaf-buds are either terminal or axillary, so likewise are flowers. But while the same plant commonly produces both kinds of leaf-buds it rarely bears flowers in both situations; they are either all axillary or all terminal, the different names of indeterminate inflorescence being given further on.

The object of the *flower* is to form the *fruit*. The essential part of the fruit is the *seed*, which brings us back to our starting-point.

In going over the ground in detail we find that plants have three ORGANS OF VEGETATION, — *Root, Stem, Leaves*.

Three ORGANS OF REPRODUCTION, — *Flowers, Fruit, Seeds*.

The flower has two *Essential Organs*, — *Stamens, Pistils*. Two *Protecting Organs*, — *Calyx, Corolla*.

The *Organs of Vegetation* are all a plant needs for its growth. They are, therefore, the FUNDAMENTAL ORGANS of plants.

The ROOT is the basis of the plant, and the principal source of its nourishment. The tendency of its growth is downward, and it is usually imbedded in the soil.

The STEM grows upwards, and bears leaves and blossoms.

The LEAVES make the *foliage* of the plant. They are generally flat, thin, green bodies, turning one surface upwards.

The *Organs of Reproduction* enable the plant to give rise to new individuals, to reproduce and perpetuate the species.

A complete flower consists of the Essential Organs, — *Stamens, Pistils*, — surrounded by the Protecting Organs, called the floral envelopes, which consist of two circles, one above or within the other. These, taken together, are sometimes called the *Perianth*. The lower or outer circle is known as the CALYX, or flower-cup, and is the outer covering of the blossom, usually green and leaf-like. Its several parts are called *Sepals*.

The COROLLA is the inner cup or inner circle of leaves of the flower. Its parts are called *Petals*.

The Essential Organs also occupy two circles, or rows, one within the other. Those in the outer row, next the petals, are called *Stamens*, and those of the inner row are called *Pistils*.

A STAMEN consists of a stalk called the *Filament*, which bears upon its apex the essential part of the stamen called the anther, a rounded, hollow body filled with a powdery matter called *Pollen*.

A PISTIL has three parts, — an *Ovary*, a *Style*, a *Stigma*. The *Ovary* contains the *Ovules* or bodies destined to become seeds. The *Style* is a prolongation of the ovary, and bears the *Stigma*. This stigma is, in reality, a portion of the surface of the style, at the apex, denuded of the epidermis, or skin. Some of the pollen from the anthers falls upon this naked, moist part; the ovules contained in the ovaries are fertilized and become seeds.

The FRUIT is the ripened ovary, which becomes the *Seed-vessel* (or *Pericarp*). A SEED is a fertilized and matured ovule. It consists of a *Nucleus* or *Kernel*, usually enclosed in two integuments or seed-coats. Besides the true seed-coats, there is sometimes an outer loose covering, arising from the expansion of the apex of the *Seed-stalk* or *funiculus*, called an *Aril*. Mace is the aril of the nutmeg. When the seed is detached from the funiculus there is left upon it a little scar called *Hilum*.

The NUCLEUS or KERNEL is the whole body of the seed within the coats. It consists of the *Albumen*, when this substance is present, and the *Embryo*. Where there is no albumen the whole kernel consists of the embryo.

The ALBUMEN is a store of nutritive matter, in a very condensed form, accumulated about the embryo for the purpose of nourishing it until it is strong enough to obtain and assimilate food for itself.

The EMBRYO is the plant in miniature. All other parts of flower, fruit, and seed are subservient to its production, protection, and support. It possesses, in an undeveloped state, all the essential organs of vegetation, — a root, a

stem, and leaves. In many cases these several parts may be distinguished in the seed. It consists of one or more *Cotyledons* or *Seed-leaves*, a bud called the *Plumule*, and a *Radicle*, an original stem which gives rise to the root.

When an embryo has but one cotyledon it is said to be *Monocotyledonous*, *Dicotyledonous* when it has a pair of cotyledons, *Polycotyledonous* when it has more than one pair.

Plants are divided into two *Classes*, — *Cryptogamous*, or *Flowerless Plants*; *Phænogamous*, or *Flowering Plants*.

The *CRYPTOGAMOUS PLANTS* are such as are produced by spores in place of seeds. *Spores* are single, specialized cells, which originate in some of the ordinary modes of cell production and without the agency of proper flowers. Most plants of this class, however, have organs analogous to those of the flower, at least in function. Ferns, mosses, and seaweeds are of this class.

The *PHÆNOGAMOUS* Plants are divided into two *Classes*, — *Gymnospermous* (naked-seeded) *Plants*, and *Angiospermous* (covered-seeded) *Plants*. In the former class the flowers are of such extreme simplicity that they consist, some of a stamen only, others of one or more naked ovules, borne on the margin of an evident leaf, as in *Cycas*, or on the base or inside of an altered, scale-like leaf, as in the *Pine* family. In the latter class the flowers of the simplest kind, consist, one sort, of a stamen only, the other of a pistil only; but as we rise in the scale these organs multiply, both are found in the same flower, both are protected or adorned with the calyx and corolla, and thus we have the completed flower, exhibiting the *Organs of Reproduction* in their perfect form.

In *Phænogamous* plants the *Organs of Vegetation* also exhibit their perfect development. Root, stem, and leaves are well defined.

In all *Cryptogamous Plants* furnished with a distinct axis, or stem and leaves, the whole structure is formed after germination, and when formed the axis grows from the apex only, having no primary root. *Phænogamous Plants*, on the contrary, are developed directly from an embryo plantlet, — from an axis and its appendages, which exists in the seed, and which grows both ways in germination, — from one end to produce the root, from the other the stem.

The *Radicle* is the rudimentary axis. The *Cotyledons* are the undeveloped first pair of leaves. The leaves rise into light and air, the root turns downward into the soil. These tendencies are absolute.

We may say, then, that the axis, especially in plants of the highest grade, is composed of a *Descending Axis* or *Root*, and an *Ascending Axis* or *Stem*. The place where the two unite is called the *crown*, *neck*, or *collar*. Both root and stem branch, and the branches obey the laws of the axis from which they spring.

We will consider, in succession, the *Organs of Vegetation*, beginning with the simplest of these organs,

THE ROOT.

The office of the root is to provide the nourishment required by the plant for its growth. Most roots grow in the earth; some grow in water, as those of the Duck-weed; some hang in the air, and some grow into the substance of other living plants.

The root formed from the embryo as it grows from the seed is called the *Primary* or *True* root. All other roots are *adventitious*.

Annual roots are those of a plant which springs from the seed, flowers and dies in the same year or season. Such plants have *fibrous* roots, composed of slender fibres or rootlets proceeding laterally from the main or *tap-root*, as in the mustard, or else the whole root divides at once into such fibrous branches as in all annual grasses.

Biennial roots are those of plants which do not blossom until the second season, and then perish like annuals. In these the cells of the roots become filled with starch, vegetable jelly, sugar, etc. Such roots are said to be *fleshy*, and receive names according to their forms.

The root, when of one main body tapering downwards to a point, as that of a carrot, is a *tap-root*, and when stout, tapering gradually from the base to the apex, is *conical*, as that of a parsnip or beet. When thicker in the middle, tapering upwards as well as downwards, like a radish, it is *fusiform* or *spindle-shaped*; *napiform* or *turnip-shaped* when it is broader than it is long, or has a suddenly-tapering tip; *fasciculated* or *clustered* when some of the branches are thickened, instead of the main axis; *tuberous* or *tuberiferous* when the branches assume the form of rounded knobs; *fibro-tuberous* when some of the adventitious roots are enlarged, others not; *palmate* when the knobs are branched.

These must not be confounded with tubers, such as potatoes, which are forms of stems.

Perennial roots belong to a third class of herbs and to all woody plants which annually produce new roots and form new accumulations, some of which perish each year, while the individual plant survives indefinitely.

Secondary roots, also called *adventitious roots*, spring from any part of a growing stem that lies on the ground.

Aërial roots are such as strike from the stem into the air, some of which may reach the ground and help to nourish the plant.

Aërial rootlets serve in most cases as mechanical supports to the climbing vine to which they belong, the plant receiving nourishment from its ordinary roots embedded in the soil.

Epiphytes, or *air plants*, have roots which never connect with the soil, but find nourishment in the air.

Parasitic plants strike their roots into the bark or wood of the species on which they grow, and feed upon the sap.

THE STEM

Is the ascending axis which in the embryo grows into the light in a direction opposite to that of the root. It does not uniformly retain the

ascending direction taken at the commencement of its growth. It sometimes trails along the ground or burrows beneath it. Stems are commonly known from roots by the buds which they produce. The production of leaves is characteristic of the stem.

These are formed only at certain definite and symmetrically arranged points called *nodes*, literally knots, so called because here the tissues are interlaced or interrupted. This is conspicuously seen in a stalk of Indian corn or any grass; each node forms a distinct ring, the leaf arising from the whole circumference of the stem at that place. The portions between the nodes are called internodes, and a leading peculiarity of the stem is that it is formed by a succession of similar parts developed one above another.

There are two conditions which constitute the important differences between stems, namely, stems with the internodes developed, as in peas, beans, etc., and stems with the internodes not perceptibly developed, as in the houseleek.

The apex of every stem capable of further terminal growth is crowned with a *bud*; *branches* spring from lateral or axillary buds. These are new, undeveloped axes, which usually appear one in the axil of each leaf. The branches growing from these are in turn provided with buds, and so on indefinitely. The latest twigs are termed *branchlets*.

If the buds are regularly produced, the branches will be *opposite* when the leaves are opposite, and they will be *alternate* or *scattered* and *irregular* according to the arrangement of the leaves and the development of the buds.

In shrubs and trees, therefore, the general form is dependent on the growth of the bud and the position of the leaves.

Adventitious buds are those which originate in the parenchyma or the membranous cellular tissue, some cells of which take an independent development.

Accessory buds are multiplications of the regular axillary bud.

The *habit* of a stem results from the condition of the texture of its parts. It may be *herbaceous*, that is, soft, green, and tolerably firm, as in most annuals, and then either *erect*, *procumbent*, *trailing*, *prostrate*, *running*, *creeping*, *decumbent*, *climbing*, *twining*.

Herbaceous stems may be *succulent*, as in the stone-crop, or *fistular*, as in grasses.

Stems with undeveloped internodes are called *acaulescent* or *stemless*. In these the stem is very short, or concealed in the ground.

All *phænogamous plants* have stems.

The following are the chief forms of stems:—

Annual stem.

Erect perennial stem (when large, called a trunk).

Rhizome or *root-stock*; a horizontal, subterraneous, perennial stem, on which the flowering stems, annually developed, die down each year.

Stolon; a form of branch which curves to the ground, strikes root, then forms an ascending stem. Currant bushes spread by stolons. Such plants are said to be *stoloniferous*.

Runner; a slender branch sent from the base of the parent stem, which strikes root at its apex, and produces an independent plant; *ex.* strawberry.

Such branches are termed *flagelliform*.

Sucker; a branch which springs under ground, roots, and sends up an independent stem; *ex.* rose. Said to be *surculose*.

Offset; a short, prostrate branch, with a tuft of leaves at the end, which takes root; *ex.* houseleek.

Culm; the name given to the peculiar jointed stem of grasses and sedges.

Caudex; any persistent erect or ascending rootlike form of main stems; *ex.* palm.

Peduncle; the stalk of a solitary flower.

Pedicel; the name applied to a subdivision of the peduncle.

All the internodes between calyx and pistil constitute the *receptacle* or *thalamus*.

A stem is said to be *excurrent* when the primary axis is prolonged without interruption; *diliquescent* when the main stem is arrested and lost in the branches.

A *Tuber* is a root-stock thickened at the end.

A *Corm* or *solid bulb* is a rounded tuber.

A *Bulb* is a scaly or coated and usually subterranean bud.

Stems are divided into two great *Classes*, — *EXOGENOUS* (*outside growing*), *ENDOGENOUS* (*inside growing*). The *Exogenous Class* is by far the greater in every part of the world.

THE LEAF

Is the organ in which, under the agency of sunlight, the sap, taken in by the root, conveyed by the stem, is digested and converted into proper nourishment for the plant. It is made up, like the stem, of a cellular portion and the skeleton or framework which gives it form and strength.

A *skin* or *epidermis* invests the leaf, as it does the whole vegetable. This skin has thousands of little mouths, called *stomates* or *breathing-pores*. These open into air-chambers, and afford a free communication between the external air and the interior of the leaf.

Leaves usually expand horizontally. The development proceeds from the apex towards the base. A leaf with all its parts complete consists of the *blade* or *lamina*, with its *petiole* or *leaf-stalk*, and a pair of *stipules* at its base. Many leaves have no leaf-stalk; they are then said to be *sessile*. The lower part of the petiole is usually enlarged so as to embrace the stem. This part is called the *sheathing* portion.

In *monocotyledons*, especially grasses, the sheathing part of the leaf is usually well developed, and the petiole consists of a sheath embracing the stem. This, in true grasses, has at its summit a membranous appendage called a *ligule*.

In *dicotyledons* the sheathing part is not much developed, but is often thickened, and applied upon a slight swelling of the stem called the *pulvinus* or cushion. When the leaf falls, it usually leaves a scar called a *cicatrix*. A leaf separating in this way is said to be *articulated* or *jointed* to the stem. Leaves which do not fall in this way wither on the stem.

When the stipules are blended with the petiole, as in the rose, they are called *adnate* stipules. Sometimes, as in the pea, they are *free*, standing on each side, like little leaves.

When stipules exist where leaves are opposite, there is either a pair on each side between the leaves, or each pair is blended into one, and are termed *interpetiolar*. Stipules are *intrafoliaceous* when, as in the plane, they are pushed back to the side of the stem opposite to the leaf, and are blended into one leaf-like body.

Leaves are arranged in various ways upon the stalk. They are *scattered* or *irregular*, as in the potato; *alternate*, one above the other on opposite sides, as the pea; *opposite*, two on the same node at opposite sides of the stem, as the lilac; *whorled* or *verticillate*, more than two on each node, forming a circle, as meadow lily; *fasciculated* or *tufted*, when the leaves grow in tufts, as pines; *imbricated*, when the leaves overlap one another. When this happens at the base of the stem, as in the houseleek, the lower leaves are said to be *rosulate*. *Secund*, when the leaves on one side of a branch curve so that their points turn in the same direction as those on the opposite side; *distichous*, when arranged in two ranks, as the yew; *tristichous*, when arranged in three ranks.

The mode of attachment to the stem exhibits many varieties. The point of attachment is termed its *insertion*. We have *sheathing leaves*, — grasses; *stalked leaves*, — lilac; *sessile leaves*, when there is no perceptible petiole. Sessile leaves are called *clasping* or *amplexicaul*, when they embrace the stem with their bases. When the stem has the appearance of passing through the leaf, the leaf is called *perfoliate*. When two opposite leaves grow together, they are *connate*. Occasionally the bases of the sessile leaves are prolonged into leaf-like wings, and are called *decurrent*.

The two *Great Classes* of *Flowering Plants* may be distinguished generally by the venation of the leaves. *Parallel-veined* leaves are characteristic of *endogenous plants*, while *Reticulated* or *Netted-veined* leaves are almost universal in *Exogenous plants*.

Parallel-veined leaves are of two kinds: 1. Those with veins all running from the base to the apex of the leaf; and those where they run from the midrib to the margin.

Netted-veined are likewise divided into *Feather-veined* and *Radiate-veined*.

A fibre running up the middle of the blade, giving off branches from each side, is called a *Midrib*.

When there is one principal midrib, with side branches, the leaf is *penni-veined*. When the ribs spread out like a fan, it is *palmi-veined*.

Leaves are *Simple* or *Compound*.

When the subdivisions of the blade are all distinctly connected, it is a *simple leaf*. When they are entirely separate it is a *compound leaf*.

These separate parts are called *Leaflets*. In a few cases they have stipules of their own, which are called *stipells*.

In many plants *Spines* and *Tendrils* are produced in the place of leaves or

parts of leaves. In the Cucumber one of the stipules is transformed into a tendril. In the Pea the midrib of the last leaflet is a tendril.

Leaves are *Linear*, — narrow, much longer than broad, and about the same width throughout; *Lance-shaped* or *Lanceolate*, — narrow, longer than wide, tapering; *Oval*, *Ovate*, — egg-shaped, broader at the base; *Obovate*, — egg-shaped, broader at the apex; *Orbicular* or *Round*; *Spathulate*; *Cuneate* or *Wedge-shaped*; *Ensiform*, — shape of a sword-blade.

With regard to the shape at the base. *Heart-shaped* or *Cordate*; *Kidney-shaped* or *Reniform*; *Auricled* or *Eared*, — having a lobe on each side of the base. *Sagittate* or *Arrow-headed*; *Hastate* or *Halberd-shaped*; *Peltate* or *Shield-shaped*.

As to the apex, we have the following terms. The first six apply to the base as well: —

Pointed, *Taper-pointed*, or *Acuminate*; *Acute*; *Obtuse*; *Truncate*; *Retuse*; *Emarginate* or *Notched*; *Obcordate*, or inversely heart-shaped; *Cuspidate*; *Awned* or *Aristate*, when furnished with a beard. *Mucronate*, abruptly terminated by a hand-shaped point.

The margins of leaves are either *Entire*, — without teeth; or *Divided*, — toothed. They are *Dentate*, — teeth pointing outward; *Crenate*, — teeth rounded and broad; *Serrate*, — teeth like a saw. *Bidentate*, — large teeth which are again toothed; *Wavy* (*Repand* or *Undulate*) *Sinuate*, — strongly wavy or sinuous; *Incised* or *Jagged*, — teeth deep and irregular. *Lobed* or *Cleft*, — blade cut up into parts.

Compound leaves are either *Pinnate*, *Palmate*, or *Digitate*.

Pinnate leaves have their leaflets arranged along the sides of the main foot-stalk.

Palmate or *Digitate* bear their leaflets all at the very end of the foot-stalk.

Twice and thrice *compound leaves* are not uncommon.

When a leaf is divided three or four times it is said to be *decompounded*.

THE FLOWER.

Inflorescence is the mode of flowering, or the situation and arrangement of the flowers on the plant, and is governed by the same law that governs the arrangement of the leaves, that is, as we have the *terminal bud* and the *axillary bud*, we also have *Terminal Inflorescence* and *Axillary Inflorescence*.

The main stalk of an inflorescence is called the *Peduncle*. It may be simple, bearing one solitary flower; or branched, bearing many flowers. The term *Pedicel* is given to the stalk of the individual flower, in this case. When the peduncle arises from an underground rhizome, as in the Daisy, it is called a *scape*. The extremity of the peduncle is called the *receptacle*.

The leaves of a flower-cluster take the name of *Bracts*. A circle of bracts, forming around the lower ends of the pedicels, is called *Involucre*. These exhibit the same kind of arrangement as true leaves. Smaller bracts appearing on the pedicels are called *Bractlets*.

Inflorescence is *Centripetal* (indefinite) as the Mignonette; or *Centrifugal* (definite), as the Geranium.

The *Solitary Flower* is a single peduncle bearing one flower. There are different kinds of flower-clusters. Of those which bear their flowers on the sides of the main stalk, in the axils of leaves or bracts, the principal kinds are the *Raceme*, the *Corymb*, the *Umbel*, the *Head*, the *Spike*, the *Panicle*.

A *Raceme* is a cluster with blossoms arranged along the flower-stem, *ex.* Lily of the Valley.

A *Corymb* is a flat-topped or convex cluster, like that of Hawthorn.

An *Umbel* is a cluster in which the pedicles all spring from the same level, *ex.* Milk-weed.

A *Head* is a peduncle, which, instead of branching, bears a great number of little sessil flowers, as the Red Clover.

A *Spike* is a lengthened flower-cluster with no perceptible pedicels to the flowers. The common Mullein is a good example. A *Panicle* is an irregularly branching, compound flower-cluster. A *Catkin* is a spike with scaly bracts, *ex.* Willow. A *Spadix* is a spike with small flowers on a thick and fleshy axis, *ex.* Sweet flag. A *Cyme* is the general term applied to all forms of inflorescence in which the terminal bud opens first. A *Fascicle* is a close or very much crowded cyme.

FORMS AND KINDS OF FLOWERS.

A flower answers to a branch ; the parts of the flower answer to the leaves. The outer circle, the sepals, is sufficiently like a circle of bracts. In the second circle the petals are like leaves in form, and veining, and in their division into blade or limb, and claw, which correspond to blade and stalk in a leaf. The third circle — the stamens — again bears a distant resemblance to leaves, and the organs of the fourth circle usually return to the leafy appearance in color. The *carpels* (a circle of pistils, or pistils blended into one large pistil) are undoubtedly forms of the leaf.

A complete flower is always a perfect flower. A perfect flower is not necessarily a complete flower. A *perfect flower* has both stamens and pistils : an *incomplete flower* wants one, at least, of the four kinds of organs. It may be *Apetalous*, that is, having no petals ; naked, or *Achlamydeous*, having neither calyx nor corolla.

Plants bearing imperfect flowers have two kinds of blossoms, — *staminate*, or *sterile*, and *pistillate*, or *fertile*. Flowers are *symmetrical*, having an equal number of parts in each circle ; *unsymmetrical*, number of parts in each circle unequal ; *regular*, all the organs alike in form and size. *Irregular*, *coherent*, and *adherent*. The number of organs in each circle in *Dicotyledons* is five, sometimes four ; in *Monocotyledons*, three.

The *Calyx* is said to be *toothed*, *cleft*, *parted*, *lobed*. The united portion is called its *tube*. The distinct portions of the sepals are termed *teeth*, *segments*, or *lobes*, according to their length as compared with the tube. The orifice of the tube is named the *throat*. The terms *regular* and *irregular* are applied to the calyx and corolla, as well as to the whole flower.

The *Corolla* is said to be *monopetalous* or *gamopetalous*, *dipetalous*, *tripetalous*, *polypetalous*, etc., when it is composed of united petals, or two

or many separate petals. The *polypetalous corolla*, when regular, may be *cruciate*, *rosaceous*, *caryophyllaceous*, *liliaceous*. Among the irregular poly-petalous corollas we have the *papilionaceous* or *butterfly-shaped* corolla, as in the pea tribe. *Stamens* are *monadelphous*, *diadelphous*, *triadelphous*, *polyadelphous*, when their filaments are united into one, two, or more sets. Stamens, when attached to the corolla, are *epipetalous*. *Pistils* are *simple* or *compound*. The partitions which divide the compound ovary into cells are evidently composed of the united contiguous portions of the walls of the carpels. They are called *Dissepiments*. A single carpel has no proper dissepiment. *Ovules* are, according to their position, *erect*, *pendulous*, *ascending*, and *suspended*. The ripened ovary, with its contents, becomes the FRUIT. *Simple fruits* may be classified into *fleshy fruits*, *stone fruits*, and *dry fruits*. Fleshy fruits are the *berry*, the *pepo*, the *pome*. Stone fruits are *plums*, *cherries*, and *peaches*. Fleshy fruits and stone fruits are indehiscent; that is, they do not split open when ripe, to discharge their seeds; while dry fruits are dehiscent, taking the general name of pods; or they are indehiscent, of which the principal kinds are the achenium or akene, the grain and the nut.

XVIII.

BOTANY AS APPLIED TO INDUSTRIAL ART.

YOU have had already a comprehensive essay on Structural Botany. I shall proceed to give you a few notes on Botany as connected with art and general utility, after offering some slight observations on structure,—not always to be much dwelt on, but well worthy to be remembered in taking up the subject, whether with reference to the one or the other.

The nature and kind of plant may be at first determined by its veneration, or packing in the bud; its class by its being monocotyledonous or dicotyledonous, that is, possessing one or two cotyledons. Here we may observe of monocotyledons that they are central growers or endogens; their leaves clasp the stem; they are parallel-veined; and the parts of their flowers are always in threes, never in fives; their roots also are adventitious. Dicotyledons are outside growers or exogens, and form a new ring of wood every year outside of the last year's growth. Exogens also have their leaves articulated to the branch and reticulated in the veining; their flowers are mostly in parts of five or four.

These are important distinctions, and at once point to the great class to which any individual plant belongs. The form of the plant depends much upon the development or non-development of the internodes, or spaces between the nodes, as also on whether its buds are axillary or terminal. We see rosette-like plants, as the houseleek, with imbricated leaves crowding one another, and find the internodes between the leaves and branches are undeveloped. The pine family presents the curious fasciculated arrangement, the small bunches of needle-like leaves being undeveloped branches. Were the internodes developed, we should have the usual pine branch, with the leaves ranged oppositely or alternately. The root of the plant may be a prolongation of the radicle or true root, or it may be adventitious, where the true root is suppressed, and surrounding rootlets supply its place. The growing point in roots is always just behind the spongiole, which is a minute, sponge-like body, without covering, situated on the end of the rootlet,—just as the growing point in the trunk is in the cambium layer, immediately behind the bark.

The root, stem, and leaves are all that distinguish a plant, as flowers are but altered branches. We see this exemplified in the monstrous flowers

cultivated by gardeners, where the parts of the flower are transformed into leaves. A flower is called symmetrical, if its parts are similar and its numbers the same, or multiplications of a given number; bisymmetrical when it can only be twice divided, as in the violet.

Speaking of the anther, it may be sessile, adnate, or versatile. It may open in four distinct ways: by a slit along the top, as in the mallow family; by two pores, as in the azalea and some heaths; sometimes a part of the face separates as a trap-door, hinged at the top, opening to discharge the pollen, as in the barberry; sometimes one half of the anther is obliterated, as in the globe amaranth of the garden. The pollen is very different in different plants, so that a plant may be recognized by its pollen alone. There are four kinds of ovules, distinguished by the position in which the hilum and the orifice are situated with regard to each other. When a plantlet is developed in the ovule, it becomes a seed. Plants will support themselves by twining, as the morning glory; by prickles, as goosegrass; by small suckers, as the dodder; by short roots, as the ivy; and by tendrils, as the pea.

The works of botanists contain minute descriptions of more than 80,000 distinct kinds of plants, each member of this assemblage having a name assigned to it, and a character by which it may be distinguished from every other known vegetable. The name is composed of two Latin words, — one significant of its genus, or relationship with plants very like it, the other expressive of some feature peculiar to itself. Out of this simple method a scientific language has arisen, comprehended by botanists throughout the world. Thus, when we write of the *Quercus Alba*, botanists in all nations understand by the generic word *Quercus* a plant presenting an assemblage of characteristic organizations such as are common to all oaks, and are combined in oaks only; and by the scientific epithet *Alba* they understand that particular oak to which we give familiarly the name of white oak, and that oak only.

The people of all countries and climates, from the first appearance of the human race, have applied their vegetable productions to use. The spreading tree and its leaves seemed symbolical of shelter and clothing, whilst its fruit suggested the most natural of foods. However far our historical researches may lead us, we can discover no trace of an epoch when the textile and coloring uses of plants were unknown and unapplied. We find everywhere erections of timber, and fabrics woven of vegetable fibre. At all times we see the evidence that it is man's nature to subdue the vegetable kingdom to his service.

The botanical domain is eminently suggestive of tasteful ornament. The graceful curves and elegant shapes of foliage, the droop of a peduncle, the symmetry and harmonious coloring of a flower, — all sow the seeds of taste wherever there is intelligence to warm them into germination. The savage decorates his canoe with imperfect images of the wild flowers that star the thicket around his hut; he stains his body in patterns with the bright-colored juices of the herbs that cluster about his doorway; out of the crimson

berries and speckled seeds, strung on the fibres of a lily or a grass, he makes necklaces and armlets for festal occasions.

Civilized man, whose observing and reasoning faculties have ripened through the genial influences of education, sees in the humble efforts of his savage brother the indications of paths leading to art, skill, and discovery. In pursuing them, he does not fail to observe that all substances in which vegetable forms have been imitated, whether by modelling, carving, casting, printing, painting, or inlaying, are not equally adapted for the representation of all kinds of ornamental plants. Leaves with broad, leathery lobes, borne on stiff-jointed peduncles, suit castings in bronze and iron, or carvings in low relief on wood; but delicate and pinnated foliage, or slender fern fronds, require high or complete relief, and those intended to stand out light and prominent must be executed in the most precious metals, and can neither be carved nor cut with natural effect.

It is curious to notice how the native of the tropics, the region of luxurious growth, takes his clothing and weapons mainly from the vegetable world. The North American Indian has his birch-bark canoe, a simple and rapid yet efficient construction; and the wilder tribes of Asia exhibit still more abundant evidences of their ingenuity in turning the beautiful flora of their countries to account. They make hats of the screw-palm more serviceable, and unquestionably more elegant than the barbarous head-gear of the West. They construct mats and fans from the bamboo, the mightiest of grasses; floor-cloths of rattan, fishing-nets of cotton, and others woven from the fibres of pineapple and papyrus. The New Zealander weaves or plaits the flax of his country; and the inhabitant of the Society Islands makes mats, coronets, and cloth of pandanus, sacca, and breadfruit-tree.

All plants have been grouped under two great heads,—those with distinct flowers and those apparently flowerless, the former reproducing themselves by seeds, the latter by spores. Flowering plants are regarded as of higher organization than the flowerless; their tissues present vascular or woody structures which are but imperfectly developed in the flowerless plants, and only in a few tribes of the higher orders

The most rudimentary forms of flowerless plants are exceedingly minute, and approach so nearly to the nature of the lowest forms of animal life that botanists and zoölogists are in doubt, even after the closest investigation, respecting their true position. In some parts of the world, their remains have accumulated so as to form strata of considerable thickness, serving as food, as in the case of the famous bergmehl of Sweden, but more frequently for the making of a powder used in polishing.

Sea-weeds, a higher step in vegetation, combine in pretty forms, as frames, baskets, etc. Some varieties of algæ are used for food, as the Irish moss, *choudrus crispus*, and the *ulva* or sloke of Britain. The edible Chinese nest is constructed of a sea-weed, probably a species of *gelidium*. Iodine, much used in medicine, is procured from various sea-weeds.

Lichens are terrestrial algæ, or leathery crusts, investing trees and stones. A few are valuable for food, as Iceland moss, *cetraria islandica*. More

important are those which furnish dyes, especially those extracted from the genera that supplies the litmus archil and cudbear of commerce, yielding valuable red and blue pigments.

The two great classes of endogens and exogens into which the flowering plants are divided offer a vast number of valuable products. Of endogenous plants, the grasses hold a pre-eminent position as sources of food. Among substances adapted for manufacturing, not a few come from this family. The utility of the bamboo, some species of which attain the height of one hundred feet, has been already alluded to. From the stems of maize excellent brooms and mops are constructed, and straw has been plaited into the most fantastic and useful forms. The true palms are the most valued of endogenous plants for cabinet-making, canes, rattans, cordage, and weapons, as well as clothing. The vegetable ivory-nut is the product of a palm of the genus *phytelephas*. It is made into beautiful toys, and ornaments carved from the stony albumen of its seed, stored up for the use of the embryo plant. The curious fibre-furnishing plant agave, the uses of which are well known to the Mexicans, is now so abundant in the Mediterranean region as to give character to its vegetation. It furnishes bags, cloaks, and even paper. The black walnut of North America gives a wood of a rich purple-brown color. Its capabilities are well shown in cabinet-work.

The pine tribe, belonging to the apetalous section of exogenous plants, is peculiar as yielding valuable resinous secretions, turpentine, Canada balsam, dammar, sandarac, thus, and Burgundy pitch. The pines may always be detected by disk-bearing woody tissue, which can be seen plainly without a magnifying glass.

The great group of catkin-bearing trees supplies a vast number of valuable products, especially varieties of timber, pre-eminently oak, beech, and birch, the uses of which are almost countless and the beauty acknowledged.

In the willow we have another amentaceous tree, furnishing materials of value for domestic purposes, especially the osiers and chip-yielding willows. The bark of numerous catkin-bearing trees is of value, either for direct use, or on account of furnishing tanning or dyeing substances.

Cork is the outer bark of an oak indigenous in Southern Europe. Its ordinary uses need not be named here, but when cut into exceedingly thin sheets, a novel application has been made of it in the manufacture of light hats.

The peculiar smell of Russia leather is derived from an oil distilled from the common birch, and which is used in its dressing.

The nettle tribe is a fruitful source of valuable vegetable products which are fibrous, such as hemp and China grass. The latter, much used in its native country, and imported of late years into England, is used for the manufacture of fine cloth. Many of the figs yield caoutchouc, which is furnished, also, by the euphorbiacea or spurges. Few nations besides Britain and the United States apply it to manufactures.

Sandal-wood, from which such exquisite cabinets and boxes are carved by the natives of India, is the timber of trees of the *santalaciæ*.

Fibrous tissues capable of being woven are furnished by several plants of the daphne tribe, and the inner bark of one of them, the lazetta lintearia, is a natural lace in itself.

Among exogens that bear a monopetalous corolla, is the teak tree of India, one of the most gigantic and valuable of timber trees. A neighboring family of labiate plants are remarkable for their sweet scents and aromatic herbs; the lavenders, rosemarys, hyssop, peppermint, and thyme all yield volatile oils. The foxgloves and figworts stand beside them, and the night-shades and tobacco plants, with their associates, the capsicums and love-apples, — a strange meeting in one family of man's deadliest enemies, with several of his valued friends. The isonandra-gutta, known as gutta-percha, is one of the most useful substances introduced into the arts in the present century. The ebony belongs also to this group. From the vast order compositæ, with its 10,000 species, food in many shapes and medicine in more are the chief contributions. The madders, too, are useful in furnishing coloring matter.

The exogens with flowers, the petals of which are constantly separate, number among them many families serviceable to man. Valuable food-plants and gum-resins are supplied by the too-much-abused umbelliferæ. The gourds furnish both food and vessels to hold it.

Of all dyes, indigo is the most valuable as an article of culture. Another herb of this tribe supplies the Bengal hemp or sun, a fibrous substance of great strength. Latechu and divi-divi are imported from the East for tanning. Many and curious are the balsams of this family, — gum arabic and tragacanth; nor must we omit tonka beans, tamarinds, and senna.

From the zygomphyllæ we get the lignum-vitæ wood of the West Indies

The sinaceæ, small though the family be, hold a high place, on account of including the flax plant.

The maples make beautiful furniture wood, several varieties being sometimes derived from the same tree. The wood of the sugar-maple of North America is the bird's-eye, and also curled maple of the cabinet-maker. The gamboge trees furnish well-known resins, curious butters and oils, as well as the world-famed mangosteen.

Tea is the product of a plant nearly allied to the camellia. Camphor is the secretion of a tree of the order dipterocarpeæ, a native of the Indian Archipelago. Cotton is the hair of the seed of certain plants of the mallow tribe, of which some other kinds produce useful but less known fibres. The great tribe of cruciferæ is remarkable for the valued food-plants that it includes.

The indirect influence of the vegetable world upon arts and manufactures must not be passed over. The share it has had in giving origin to the beauty and variety of furniture, ornaments, and fabrics is too important not to be strongly insisted upon here. Our silks, cottons, and muslins, our shawls and damasks, our sideboards and cabinets, our porcelains and glass, would make a comparatively graceless array were the infinite variety of design and color suggested by flowers and fruits, leaves and stems, herbs and trees, taken away; yet when these representations are scanned by a botanist he is apt to

regard them with a dissatisfied eye, not because they fail to fulfil the requirements of scientific accuracy, but on account of the ignorance they too often display of the riches suited to the designer's purpose, lying almost within his grasp, had he known where and how to seek them. A small amount of botanical knowledge would prove very profitable to the draughtsman. Science would teach him how every stem is adapted for its own peculiar style of foliage, and how an incongruous mixture of leaves, fruits, and flowers cannot give the pleasure to the eye that, even when it is uneducated, it so rapidly and delightfully derives from the contemplation of combinations whose elements are truthful. The leaf of a monocotyledonous plant attached to the flower of a dicotyledon strikes the spectator who has no knowledge of botanical science as unnatural; for the eye learns, compares, and recollects, even when the understanding is obscure and cloudy. To the botanist, who sees heaven-devised beauties and the manifestations of divine foresight and love in all the structures and stages of vegetable organisms, such mistakes are still more offensive. The mere literal copying of nature is not what is demanded. The value to a designer of the scientific comprehension of his models is the insight it gives him of the possible in the original, and the inexhaustible sources of grace and beauty, whence so much that is new may be derived.

The parts of a plant which most readily lend themselves to ornament are the branches, leaves, and flowers. We have observed in plants certain laws and principles which are both beautiful and adaptive, giving us food for meditation and supplying ideas indispensable to the designer. 1st. Repetition, radiating from a common centre, as in a flower. 2d. Elongated repetition, as in the branching of a plant, when it, in each part, repeats the parent. 3d. Extended repetition, as in the mistletoe, chickweed, compound umbel, and hemlock. 4th. Repetition of a spot or part, as, looking at the primrose from above, it is starred. 5th. Repetition with variation, illustrated by the petals of the mignonette. Here are a number of club-shaped bodies all on one plan, yet all differing in form; there is a repetition, yet it is with variation. This may be further illustrated by the honeysuckle ornament, which is borrowed from a plant the flower of which is modelled on the same principle. 6th. There is also that form of repetition which corresponds with the side view of trees. But it is impossible, in an essay, to do more than glance at this great subject, and I must now conclude, reminding you who are chiefly interested in it as it regards art, that we, enjoying the experience of past ages with the opportunities of the present, should endeavor as much as in us lies to contribute to make this distinguished as the era of pure taste and enlightened culture, leaving for the future much to exult in and to imitate. Before we can originate, however, anything really estimable, the mind must be instructed, capacities exercised, and enthusiasm fired by the beautiful and endless varieties of nature. Let our standard be low, and we shall never rise to a high level; but with the glorious works of the great Creator before us, who can resist their ennobling influence or fail to do his part towards extending it to mankind?

XIX.

APPLICATION OF ORNAMENT TO INDUSTRIAL PURPOSES.

IN studying the history of the past we find, in passing from one stage of civilization to that which preceded it, a condition of development in which humanity became conscious of needs unsupplied. As those needs became defined and imperative, they assumed forms which supplied them, and the history of industrial art commenced.

When we analyze man's first necessities we find food, shelter, and covering for the body, for warmth in a cold climate, the three primary needs of a human being. Food was furnished by the fruits that grow without cultivation, by roots, twigs, bark, etc., and the flesh of animals. Shelter was limited to holes dug in the earth, caves, mounds raised around stakes to give stability to central cavities, or to rude erections of poles covered with skins or thatched with reeds; and from such rude efforts to obtain shelter as the shaping of trees so as to support skins in a proper manner, the breaking of rocks to be used more advantageously — have been developed the wondrous structures of beauty which now exist, with all their wealth of ornamentation. The skins of animals, feathers rudely arranged, plaited leaves, reeds, etc., were used for covering, the rudely plaited leaves took the place of the blanket, the accepted symbol of all textile art; while from the rude weapons which ingenuity provided we may trace the discovery and use of metals, which science and skill are still employed in adapting to so many purposes, and enriching by every decorative process.

After the means of supplying these wants were equal to the demand, the same spirit of progress which actuates us to-day would suggest a seat other than the ground or the trunk of a tree, etc.; something to place food upon and to convey it from place to place, other than the human hand; while at night the dew and moisture of the soil would suggest a structure upon which to rest in comfort, warmth, and safety, and thus gradually, the means of living like civilized beings would be acquired. Born of man's first necessities, the industrial arts increased and multiplied as population increased, and became refined and perfected as civilization and general education carried man onward in the scale of being. Thus we find that to trace the history of industrial art is to trace the history of civilization.

Man's first technical condition was that of a creature working to supply his own necessities. His second condition would be that of one working to supply by his labor the wants of others as well as his own. Hence came the idea of paying and receiving pay for labor, and according to the facility with which man could labor and the demand which existed for his labor, he gradually gained a greater or less ascendancy over others, and an accumulation of whatever medium of exchange represented the value of labor. As soon as the idea of paying and receiving pay for labor gained force in men's minds, the principle of manufacture was established. Men set themselves to work to produce with as little labor as possible, and at as little cost, what they considered others would be most likely to pay well for. Communities began to do what individuals had done, namely, to barter what they could easily and cheaply produce, for that which would be either costly or difficult for them to obtain, and out of this the spirit of commerce was evolved. Thus men gradually came to minister to one another's necessities. A supply was finally produced in excess of demand, and ornamentation was added to construction, creating a value outside and above absolute need,—a new source of demand requiring a corresponding supply.

Those branches of industrial art into which design and ornamentation have in all ages most conspicuously entered, may be classified as follows :—

1. Constructive arts. Those in which a desired result is obtained by an aggregation of parts, useless or inexpressive in themselves, yet fulfilling all the demands of primitive structure.

2. Sculptured industry, that is, any application of sculpture to industry, produced by working in either hard or plastic substances.

3. Ceramic art, including all forms of hardening clays by fire, and ultimately of decorating them and fixing the decoration.

4. Vitreous art, including the formation and decoration of glass in all ways, and the adaptation of the principle of glass-making as a covering or decoration to other materials.

5. Metallic art, by which is meant all the processes of the extraction and manipulation of metals, whether taken alone or in combination with other materials used in structure or decoration.

6. Textile art, comprising everything worked in the loom or formed or decorated by the needle.

7. Pictorial industry, including surface decoration, in whatever way or by whatever means applied.

Technical excellence partially consists in the apportionment of neither too much nor too little material to every purpose.

A simple form is more beautiful than a complex one, and that which best answers its end will always look best.

True beauty results from that repose which the mind feels when the eye, the intellect, and the affections are satisfied. In considering design adapted to ornamentation the only sound standard is that which requires that the ornament shall increase the beauty of useful objects without limiting their usefulness. The ornamentation of an article is something which is not necessary to its use, and the ornament is bad which interferes with that use or limits it

in any way. An excess of ornament is not enrichment, it is merely ostentatious vulgarity. A lavish profusion of ornament is often resorted to, to cover inferior work in construction.

Construction may be decorated, but decoration should never be constructed.

Flowers or other natural objects should not be used as ornaments, but conventional representations founded upon them, sufficiently suggestive to convey the intended image to the mind without destroying the unity of the object they are employed to decorate.

Conventionalism is a first necessity in ornamentation.

The lower the office and the less tractable the material of an object, the less of nature should be contained in the ornament applied to it, until a zigzag becomes the best ornament for the hem of a robe, and a mosaic of colored glass the best design for a colored window. All right conventionalism is a wise acceptance of, and compliance with, conditions of restraint or inferiority, and all these lower forms of art are to be conventional, only because they are subordinate, and not because conventionalism is in itself a good or desirable thing.

Now, this great and most precious principle may be compromised in two ways. It is compromised, on one side, when men suppose that the degradation of the natural form which fits it for some subordinate place is an improvement upon it, and that a black profile on a red ground, because proper for a water-jug, is therefore "an idealization of humanity, and a nobler work of art than a picture by Titian." It is compromised as gravely, on the opposite side, when men refuse to submit to the limitation of material and the fitness to purpose; when they try to produce finished pictures in colored glass, and substitute the incomplete imitation of natural objects for the perfectness of adapted and disciplined design.

Under the first class of industrial arts we find the parent of all arts, architecture, standing almost alone as a common basis to the Fine and Industrial Arts. Architecture is the material expression of the wants, the faculties, and the sentiments of the age in which it is created.

Style, in architecture, is the peculiar form that expression takes, under the influence of climate and material at command.

A great deal of the distinction between building and architecture, between use and beauty, consists in understanding the true position of each in relation to man's necessities and his aspirations, and this must enter into the study of one who would fit himself to perform the duties of an architect nobly.

With regard to materials, there seems good ground for supposing that the natural products of a locality are the best, and it certainly comes within the range of art to use native materials to the best advantage.

Where these are manifold, a pleasing contrast of color may be produced by the use of several kinds in one building. This association of color in material is not the first step in ornamentation, but the second. The first is the formation of lines in the construction, either in the shape of mouldings or masses of material.

Some of the most pleasing architectural effects are obtained by employing

strong material, like granite, for shafts and columns, a different stone to make string courses or bands of horizontal lines, and a third to form the plain wall, and mass of coloring.

There is considerable danger, however, of overdoing this work in colored material, and its judicious employment requires very great skill in the designer.

It is as easy to place light and dark colors in the wrong place in a building as in a picture ; and as a rule, the effect has been found the most pleasing when the lighter material forms the main part of the structure, and the darker is used for enrichment. Pleasing contrasts may also be obtained by polished and dead surfaces in marble and granite, or of glazed brick and tiles in brick-work.

Relief ornament for architectural enrichment should be a contrast of planes ; the outer leaves, if in foliage, should be concave, the inner convex ; as the concave surface absorbs, and the convex radiates light. If foliage ornament is to be gilded, the lines must be deeper cut, the outline more clearly defined than otherwise, as gilding will produce an effect like a polished surface. In subordinate parts, the decoration may be less distinctive in character, with a flatter surface. As projection produces shadow, so flatness ensures light, and hence the lowest relief is best fitted for an invariably dark situation. The flatness which ensures light would, however, be indistinct and formless, unless the outlines were clearly cut and conspicuous at the first glance. This is effected by abruptly sinking the edges of the forms to the plane from which they are raised, instead of gradually rounding and thus losing them. In many instances, the sides are under-cut, and thus present a deeper line of shadow. This device gives to a work in an obscure situation, the effect of rotundity. Flat relief is not always intended to appear so, and is better applied to interior decorations, for in the open air it often appears too flat and otherwise indistinct.

Moulding should be cut to a greater depth in dark material to produce marked contrasts of light and shade, than in light material. The designer should be acquainted with the laws of the projections of shadows, and all the varying conditions of illumination under which his work, or any parts or portions of it, are ever likely to be seen. He should know all the laws of *chiaro-oscuro*, and appreciate the extent to which, by a dexterous management of them, he may be enabled to concentrate the spectator's attention upon one part of his work, and to cause another to sink into a secondary or altogether subordinate position. He should know how to heighten effects of light by judicious contrast with strongly-concentrated shadows, and how reflections from highly-illuminated surfaces, thrown upon parts in shade, produce delicate half-tints upon receding mouldings, so that he may be able to soften the deepest black of any shadow into harmony with the highly-illuminated surface by which the shadow may be projected. He must make himself acquainted with the artistic value of the advancing or retiring qualities of colors, both in full light and in every degree of shadow, so that when he is called upon to use materials of varying tint, he may know how to reconcile inconsistencies, and maintain an equal balance between parts which, without a wise distribution, would inevitably cause an appearance of feebleness.

But all our decorations should not be placed on the outside. Interiors should not be supposed to have attained the end of their existence when the walls are finished enough to admit of their being inhabited. The decorative artist may do a great deal towards breathing a soul into rooms which without his aid would appear dead. Every part will suggest its own appropriate use, and every ornament will help to create a beauty outside of itself, when it is subordinate to the uses of the room it is employed to adorn. The pervading sentiment of a beautiful home is harmony and repose. To the visitor, coming from the glare of the crowded street, a grateful and hospitable welcome is extended by every object that meets his eye. The best principles of interior and surface decorations have been given us, and the objects placed in a room must be chosen to correspond with such decorations and the use of the room.

The earliest Egyptian paintings furnish us with illustrations of furniture apparently very simply wrought, but always in very graceful lines, with the parts arranged in a judicious and workmanlike manner. The beds or couches appear to be both simple and elegant. Assyrian seats and footstools are no less complete and well suited to their purposes than similar articles among the Egyptians. In all these archaic specimens of furniture there is a simplicity of style thoroughly satisfactory to the eye. There is never any question as to function. All are ornamented where ornament can be satisfactorily introduced, so as not to interfere with the use or appearance of use of the object, and ornament is always added by a process analogous to that by which the object has been wrought. Superadded or inlaid ornament is never obtrusive, and the eye never desires its removal. If not positively essential to construction, it always harmonizes with it, and never runs counter to it; is never omitted where it seems to be wanted, nor added where it can be dispensed with. The grain of the wood must be considered in designs and ornaments applied to chairs, etc. Strength means straightness and squareness; curvature means weakness and liability to destruction in use. Very high relief and very round, delicate carvings are bad, because wood will split, and parts will warp and crack off. Carvings should be in low relief, in recessed or sunken portions of the form, both for their own protection and its more gratifying enrichment. In enriching furniture with inlays of various colors, harmony of color with the fabric used for covering, must be taken into consideration.

The broadest definition which may be given to the art of sculpture, is that it is a means whereby the emotion of pleasure can be conveyed to the intellect through man's fashioning of the images of his mind into solid forms. These images, from the earliest ages, have assumed two forms, the one isolated, the other combined. In the isolated form they have generally constituted tangible symbols or embodiment of ideas. The god and the hero have been the earliest types. In the combined form, the art of the sculptor is so intimately connected with that of the architect as to be all but inseparable. Man probably learned how to cut away rock in endeavoring to make for himself durable and permanent shelter. So soon as the technical process of cutting material into shapes at will was acquired, a ready means of ornamenting structure was available.

By means of sculpture, structure was not only made more beautiful, but became marked and identified with times and peoples, their legends, their faith, and their works. To understand the various ways in which sculpture may be used for ornamentation, it is well to notice the varieties of relief in which the artist is able to represent his design. He may represent any image or group in completely solid form, and in the full dimensions in which he may see and place his model. This is known as working in the round; and so long as a sculptor adheres to what is called the round, he must deal with the form in the same sections and with the various contouring surfaces in the same position in which they exist in his model, subject to such deviations as the conventions of his art require.

In alto-rilievo the sculptor simply places a solid and generally flat backing behind any figure he may model in the round. The flatness of this backing, and the limit of space within which the figures have to be contained, necessitates a disposition of the figures in their leading actions, in planes parallel with the surface of the backing, but subject to such laws of disposition as have been referred to. In alto-rilievo the sculptor gives his forms the full development which they exhibit in nature. In cases where the depth is limited it may be necessary to sink a portion of the figure into the background. It is still regarded as alto-rilievo until one half its depth from back to front is sunk. In that case it is known as mezzo-rilievo, and in all varieties of depth from back to front, from half the substance down to that flatness characteristic of sculpture upon medals, the work remains in basso rilievo.

When the flatness is such that scarcely anything but a flat picture is left, "stacciato" rilievo is obtained. As a general rule it becomes necessary to flatten every part according to a scale obtained by laying out on a straight line the full dimensions of the depth of every part of the model, and then applying that line at such an angle to the surface of the background of the bas-relief as may allow its whole extent to be comprised within the parallel planes of the back of the bas-relief and a plane parallel to it, beyond which none of the parts shall project. The contour or outline of every form retains a natural scale.

When the relief is to be seen from a great distance it is necessary to raise the parts which meet the background more from the ground than if a strict scale of projection was followed. When it is closely inspected the forms although almost lost in the background may yet be clearly perceptible.

In designs for relief every principal part necessary for telling the story must be exhibited.

A certain open display is generally adopted, and shadows, or the forms which project them, so disposed as to present at first glance an intelligible appearance. When the shadows are suppressed the general form becomes indistinct.

In imitating nature, the imitation should be least truthful in objects which by their nature appertain to the material in which the sculpture is executed. A flower may be imitated in marble with an approximation to direct imitation that would be quite unfitting in a coarser stone. Things which are imitated should never be so imitated as to make us conscious of the stubbornness of

the material in which they are wrought, or of its different texture and strength.

What the nature of the ornamentation should be, must obviously be dictated by various considerations, of which the first is the destination and purpose of the work in hand. To design a figure or ornamentation for a church is one thing, for a theatre another, for a conservatory yet another. The scale upon which the work is to be executed will also limit it. The treatment of a bas-relief to be placed high up on the façade of a public building, ought to be absolutely different from that of one to be introduced into a drawing-room chimney-piece, or used as ornament for a piece of furniture. Above all, the honest truth must be told in everything. There is probably no department of ancient industry in which the genius of the art-workman is exhibited in a more concentrated form than in cutting gems ; and in applying sculpture to ornament the *Glyptic* art must not be omitted. From the most remote antiquity the engraved gem was the universal token of dominion.

The two terms used to characterize ancient gems have been generally adopted into art language as expressive of the two kinds of sculpture in which they were executed, so that it may be well to speak of the difference between *Intaglio* and *Cameo*.

In *Intaglio*, the image is cut into the material ; in *Cameo*, the ground is cut away from about the image, leaving it in more or less high relief.

Judging from the enormous quantities of these gems still extant, they must have been used by the ancients in great profusion, particularly by the Greeks and Romans. What the one craved as an intellectual enjoyment, the other demanded as the attribute and symbol of wealth. Not only were they used for personal adornment, but to ornament every object to which they would be applied.

Although it is in connection with architecture that sculpture finds its noblest adaptation, it is more or less intimately connected with the ornamentation of most of the industrial arts.

In the four operations by means of which sculpture has ever been executed, it is brought into connection with various materials. These four operations are cutting, modelling, fusing, and beating. The operation of cutting transforms granite, marble, stone, wood, ivory, precious stones, etc., from shapeless forms into works of rare beauty. The operation of modelling develops forms out of any soft matter that can be converted into an approximation to hardness. The third operation, of fusing, came into use with the knowledge of the means of extracting metals from their ores, and of that property of metals which allows them to become fluid by the action of heat, and to return to solidity on cooling. The last operation, that of beating, required the knowledge of the relative ductility of metal under various conditions.

Thus we see there are but few materials upon which the art of sculpture may not be employed as a means of enrichment ; and as the love for it seems to be a simple natural instinct, we look for it more and more in familiar household objects. We must guard against superabundance, degenerating into

inferiority, as the means of supply increase. The best way of doing this is to keep applied sculpture within its proper limits, and not employ it at the expense of simplicity, elegance of form, and propriety of use in the object to be enriched, as, in common with all ornamentation, when wrongly used it disfigures, as much as when rightly used it adorns. The word sculpture has been used as embracing all relief ornament, which is the application of sculpture to industrial purposes, in the same way that surface or flat ornament may be used to signify the industrial application of painting.

It is evident that the underlying principles by which ornamentation is properly and skilfully applied to industrial purposes, are the same in every branch, and it is the duty of the designer to acquaint himself with the peculiar limitations of material and manufacture of each object or article, and to limit his designs to their capabilities.

In past times the producer and consumer of an article were brought into direct communication, and the thing produced was sure to correspond to the conditions of civilization common to both, and to be beautiful according to the then existing perceptions of beauty and actual measure of intelligence. But in our time, when everything is manufactured in abundance, with a thought of possible storage awaiting demand, the object is stamped with a character of generalization instead of particular adaptation. The design must have reference to the wants of the trade and the needs of the masses. It follows then that, though things beautiful may be and are manufactured, they are too often those of exceptional use, rich and costly, coming within the scope of but few, while objects that pursue us everywhere are left to chance or the fancy of those who have little care for fitness and beauty combined; workmen whose only thought is the moderate cost of manufacture, and whose trust is the general demand to ensure sale.

Ornament is not a necessity to use, but it is a necessity to develop the highest, noblest faculties of our nature, to harmonize and centralize our thoughts and aspirations. As we individualize ourselves, we stamp the mark of our individuality on all we create; and if our creations are harmonious, in the whole as well as in detail, they will appeal to the innate sense of fitness in every one, and be in demand. As with individuals so with nations; and in this sense, taste and culture become of commercial value, — commodities to be bought and sold, at a fixed market rate.

Most of us shrink from the task of attempting much in design, finding that the power to produce suitable and beautiful designs is not inherent in our nature; and not only this, but that the knowledge required is so extensive, embracing so many subjects we have not been familiar with, with the addition of creative power, that we care not to make the effort to acquire it. We have also learned that it is no easy task to overrule existing ideas and practices, and create a demand for, as well as to furnish a supply of beautiful things for the most common uses of life; and as defective supply only follows defective demand, the ability to appreciate better things must first be developed among the people. This, from the position we have taken and hope to take in the educational arena, seems to be our province; and to educate ourselves to be honest and true as

teachers leaves little chance for idle eyes, idle hands, or idle dreams. It is impossible for any to form right ideas of the harmony of color, impossible to arrive at a perfect adaptation of parts in objects, decorations, etc., without a knowledge of, and an association with, such harmonies and combinations. The most perfect eye and skilful hand, combined with creative power, if human, cannot long continue to produce beauty and fitness in design, unless they are surrounded by beautiful objects in nature and art to nourish and support them. It is evidently a duty we owe ourselves to gather about us objects that have a value beyond use, that will suggest harmony, beauty, and repose, and prepare us to awaken in those with whom we come in contact an appreciation of a greater excellence in the useful articles of every-day life. Thus we may help to develop out of this first effort to establish a public school of art in America, a power which shall fill American homes, from highest to lowest, with objects which shall refine and ennoble the American nature, raising its standard of excellence, winning it to a nobler culture, that shall make our country rank second to none in art education.

XX.

ORNAMENT AS APPLIED TO INDUSTRIAL PURPOSES.

It seems to be a somewhat difficult matter to treat this subject properly without overstepping its strict bounds, or at least trenching upon the ground covered by other essays which form a part of this series. I shall endeavor, however, to keep very near the dividing line, passing over, it may be, here and there, where some root of my subject has pierced the loose soil beneath my neighbor's fence, or some branch or vine has carried its fruitage upon his domain.

I believe there is a creed extant — if not written, at least real and well defined — that art may be very properly divided into the two grand divisions of the useful and the ornamental, or, as its adherents might perhaps be inclined to put it, the *useful* and the *useless*. This creed, although doubtless quite in accordance with strict Puritanic logic, I cannot accept as orthodox; nay, more, I am constrained by a spirit that is within me to denounce it as rank heresy, false from the ethical as well as the æsthetical point of view.

Decoration is no more a luxury in a civilized state of society than warmth or clothing are a luxury to any state of society; the mind, like the body, makes everything a necessity that it is capable of permanently enjoying. Ornament is one of the mind's necessities, which is gratified by means of the eye. Man is not a unit, but a dual being, endowed with a physical and an intellectual nature, both of which must be ministered to, or he dies, — or at least that part of him which is not nourished. The physical nature requires food, drink, clothing, and shelter, — but few wants and easily satisfied; the other and higher nature demands far more, and one of the first and last of its needs is ornament. The love of ornament — not simply the love of beauty, but of ornament as well — is instinctive in the human mind.

If we undertake to deny the necessity of ornament, we must be able to show that mankind would be as well without it as with it. This is impossible, as history records no people or race that has not availed itself of its aid; and generally, in proportion as nations have become more enlightened, in that proportion ornament and ornamental art have flourished. It is a well-known fact that there is hardly a branch of all the varied industries of the

world into which ornament does not enter as a factor ; hardly one in which the value of the product is not more or less increased by its proper use. Ornament is not only useful then, but its usefulness is everywhere admitted ; if not in words, then in deeds, which are stronger and weightier than words. That which is not only useful but beautiful, or believed to be beautiful, is everywhere preferred to that which is merely useful ; thus ornament and beauty, as well as utility, become essential elements in commercial prosperity, and this in an increasing ratio, as refinement replaces barbarism, and culture supplants ignorance. The wants of the mind, no less than the wants of the body, demand to be satisfied. This being the case, ornament becomes as much an article of commerce as corn, as cotton, or as any brain work.

But as in everything else whose demand indirectly creates its own supply, so also in ornament, there is a demand for that which is good, that which is indifferent, and that which is positively bad ; and each of these demands is met, not only in quality, but in quantity and in price.

As in merchandise and morals, so also in ornament, the indifferent and bad is largely in excess of the good. Forgery and adulteration are not confined to the popularly accepted meaning of those terms, but have a wider significance in the domain of art ; for as the basest villany puts on the guise of the most exalted virtue, so likewise the basest ornament aims at passing for something more precious and costly than it is. Sterling gold is imitated by cheap gilding ; the precious diamond and ruby, emerald, amethyst, and topaz, by quartz or still cheaper bits of tawdry glass ; the exquisite mingling of light, shade, and shadow of the sculptured stone, or the modelled stucco ; the beautiful graining of mahogany, rosewood, and satinwood, and the delicate veining of the choicest marbles, are imitated or cheaply counterfeited by the painter's craft and skill.

Veneering, graining, and marbling may indeed awaken our admiration for their skilful execution, but they are worthy only of such feelings of disgust and scorn as we should mete out to him who had used his admirable skill in penmanship to forge the name of a trusting friend, his mastery of the engraver's art to counterfeit the currency of his country, or his skill in language to deceive, slander, and falsify. We take no pleasure in fair sounding phrases, if we doubt the truth of the statements they express ; nay, the more plausible they are, the more contemptible, because the more calculated to mislead : so in all ornamental art imitations, the more perfect the imitation the more it is likely to induce the belief that it is real, and therefore the more contemptible is its use.

Continued familiarity with crime deadens the sensibility to virtue ; continued familiarity with equivocation and falsehood gradually destroys all fine appreciation of the beauty of absolute truth ; and the indifference with which we view social, religious, and architectural shams and pretences from day to day, is doubtless largely the result of the persistent practice of the ornamental deception of the past two hundred years and more. We play at the childish game of "make believe," and have so long accustomed ourselves to the contemplation of "sham," that "appearances" are about all that we think

worth living for ; and many a miserable being has ignominiously slunk out of life because, forsooth, he or she could no longer "keep up appearances." Woe to the nation, the church, the man, or the art that is built upon a foundation of deception and fraud ! They will utterly perish, or be remembered only in scorn. Only the structure founded upon truth will stand the ravages of Time.

In order, then, to have worthy ornamentation, we must once and forever cast away deceptive imitation of whatever nature, and go back to the eternal foundation rock of Truth. Every principle that will not stand that searching test must be resolutely, heroically (for it often requires moral heroism to be true) cast aside.

The very first principle, then, is Truth. Owen Jones says, "That which is beautiful is true ; that which is true must be beautiful." According to the common acceptance of the term "beautiful," this sentiment may not find many converts ; but there is in its higher sense, and in its deeper meaning, a truth not only beautiful but absolutely sublime.

Principles in art are something like laws in civil government : they may be observed as to the letter, and evaded as to the spirit ; but such observance is only better in degree than open violation. Once let this fundamental principle of Truth be thoroughly rooted and grounded, and the foundation at least is laid for an epoch of art that shall rival that of Greece and overshadow that of Rome.

And now, having laid the foundations of our structure (to continue our metaphor) upon the solid bed-rock of Truth, we may rear the columns which are to support our fabric, namely, Utility, Fitness, Adaptation. Let us adopt these words as the names of the leading principles of Industrial Art and of Ornamentation, for there can be no true excellence where they are ignored or disregarded.

Given this problem, then : to construct and ornament any article whatever, the mind must work in something like this order : —

First, the demands of Utility : What are the uses of this object ?

Second. What material is most fit for its construction, or best adapted to meet all the requirements of the object ?

Third. What form is best suited to it, considering its uses, the material selected, and the method of manufacture that the nature of the material imposes upon us ? and how can this general form be made most beautiful with the least outlay of labor, material, or skill, without detracting in any degree from its utility or making it too fine for its proposed use ?

Fourth. How is it to be additionally ornamented or enriched, to make it more beautiful, though subject to all the above conditions and restrictions ?

Upon each of these successive divisions much thought must be expended, and the excellence of the product will serve to show what that thought has been, and whether it is the offspring of ignorance or knowledge. An aimless ambition, that seeks to startle you into admiration by some trick or novelty, is usually the characteristic of ignorance ; a thoughtful simplicity, that foresees and considers every requirement of utility and of correct taste, and strives to

meet it in the most obvious way without trick or sham, is equally the characteristic of knowledge.

As every work is, to a certain extent, a moral and intellectual no less than an æsthetical portrait of its designer, to be scanned by every intelligent spectator, thought and reason, not fancy and memory alone, should determine every decision.

Utility is the first law, therefore the use to which the object is to be put is first to be thought of. The ornament is subordinate to the object it enriches, and should receive attention only after the use, material, and general form of the object have been considered and determined upon, and this would seem to be the first thing to be considered. "Is it pretty?" "Is it striking?" not, "Is it convenient and suitable?" is the more common order. Yet there is an abstract beauty in fitness, without which all other beauty is unsatisfactory; it far surpasses all other forms of beauty, because it acts not only upon the eye, but through the judgment also. Any article that does not answer the end of its creation in the best and most consistent manner, is not beautiful; in just that degree it may be made up of lines and forms, colors and materials, that are each and all beautiful, but if it has not the beauty of fitness it lacks the first element of true beauty. The watch that will not keep time, the carriage that lacks the requisite strength to support its load, the eyes that cannot see, the hands that cannot labor, have no beauty in them, because no fitness.

Utility, then, must be *first*, and a disregard of this principle argues ignorance or inefficiency — generally both. It is disregarded by the architect who expends all his talent, and all the available money of his employer, in embellishing the exterior of a building whose interior is deficient in actual convenience; whose rooms are poorly arranged or poorly lighted; whose floors are shaky, and whose entire unworthiness is in startling contrast to its exterior pretence. It is disregarded by the tailor, the dressmaker, and the shoemaker who sacrifice comfort and utility to style, and torture you into the unchristian wish that they might be compelled to wear the garments they have prepared for your use; it is set aside by that fickle Goddess of Fashion who decrees that you must wear expensive stuffs in such a manner that they must soon become soiled, and yet cannot be cleansed without destroying them; as well as by that high-toned sentiment, so very commonly entertained, that it is more honorable to be a wealthy dunce than an intelligent and useful worker whose hands and brow betray the signs of honest toil.

What material is best adapted to meet all its requirements? This again demands thought. Perhaps gold is most appropriate, but its use is precluded by its cost. How then, — shall it be an inferior metal, wearing the semblance of gold? No; a thousand times no! Silver, brass, copper, tin, clay, — what you will, if only the material be adapted to the use of the object; but whatever it be, whether silver or clay, let no mean ambition induce you to try to deceive another as to its true nature or value. The appearance of success gained by such means is worse than the most unequivocal and palpable failure; nothing can justify it, nothing palliate the fraud. Not only Truth and Utility, but Adaptability and Fitness enter into a consideration of this

division of the subject. The plastic clay of the potter, the ductile wrought-iron of the smith, and the unyielding granite from the mountain-side, may be wrought into the same forms, with a relative amount of toil, and comparatively satisfactory or unsatisfactory results. The clay has the quality of plasticity, possessed to a less degree, or not at all, by the other materials, and this quality should determine its treatment. In the earthen vase, the terra-cotta ornament, modelled and baked, this plastic quality is unmistakably presented to the understanding through the eye. So of wood: it has certain well-known characteristics peculiar to it alone. It will shrink or expand under certain influences; it will bear a great tensile or crushing force in the direction of its fibres, but not across them; it is easily planed and sawed, cut, turned, and carved, but cannot be beaten into shape like iron nor modelled like clay; it may be steamed and bent into forms, and, if seasoned in those forms, will retain its shape under certain conditions. Its treatment should, therefore, be in accordance with these qualities, and, so far as any expression is called for, should proclaim them unmistakably. To employ wood in an arch, as you would employ stone; to fashion it into the form of buttresses or pinnacles, as though its weight were an element of stability, is to falsify its character. Its use should rather be such as to say in unmistakable language, "Lo, I am Wood; my strength is in my fibre and grain; you may rely upon me so far as my inherent nature gives me the power to serve you,—only let me be myself and serve you in my own way, however humble. I am satisfied to be simply wood, and am ambitious to be nothing else. Protect me from the weather and from the effects of damp, if you will; but do not force me to appear like marble, for however beautiful it may be, it is too cold and hard for me; nor like gold, however precious, for it has an evil glitter that is akin to envy. No, no; I am neither proud nor aristocratic nor rich nor haughty. I am content and happy to be of use where I can be myself, and not another."

Form should therefore be so subject to the requirements of the general principles before enumerated, as to harmonize with other objects with which it is to be associated. Neither time nor space permit more than a mere allusion to the principles of design. A knowledge of the fundamental principles of Unity, Repose, and Breadth is presupposed, and how the effects thus designated are realized. There must be unity, then, between the form under consideration, and the various forms with which it is to be surrounded; and this unity should extend, not simply to unity of abstract form, but to unity of historic style, and to that still more subtle unity of color, and tone, and character, vaguely characterized by the general term "in keeping."

But while we consider form from an æsthetic point of view, we must not lose sight of that practical question, How can this form be best realized in the material selected? And this consideration demands a knowledge of the technical processes of manufacture, so that knowledge of the methods of the workshop may go hand in hand with a knowledge of art principles. An architect must virtually be a builder as well, and understand the technic of every craft employed in carrying out his designs; and a designer of any work

must know, not only what is correct in principle, but what is practicable and best in execution as well ; otherwise, however ingenious, however learned in general principles of art, he has no business to pretend to be a designer. There is a proverb that exactly suits this place : "For if the blind lead the blind, both will fall into the ditch." If true, as doubtless it is, what must be the present condition of the ditch !

How to ornament. What is the most obvious method, determined by the material ? What kind of lines and forms can be employed, which will best bring out and enhance the beauty of the contour, be easily executed, and suffer least from any distortion produced by any accidental point of view ? If relief ornaments are appropriate, and decided upon, as well as the amount of relief that will make the decoration sufficiently conspicuous, without destroying the unity of form of the object decorated, the applied ornament must be subordinate to the object enriched, as the form of that object is in turn subordinate to its use. This principle of subordination, growing out of the broader principle of unity, deserves very particular notice. The scale of subordination must be very nicely adjusted, from the use of the object down through all minor considerations, to the position, form, and color of the most minute detail of ornament, the governing principle being, that everything is to be elaborate and conspicuous in just the degree that its importance warrants, unless practical considerations operate to suspend this rule. For instance, in a building, the foundations and the piers are two of the most important features, but the foundations are not ornamented because they are concealed from sight. The piers or columns are ornamented according to the principle advocated, the capital receiving the most elaborate ornamentation, the base and shaft such as will render them beautiful without destroying either the sense of unity or of fitness. They must have no elaborate carving to be chipped away by rude contact with passing bodies ; no deep cuttings to retain the dust and grime which would be sure to gather in them ; no bright, pure colors which will become soiled and worn away, but bold, massive, smoothly wrought surfaces, or mouldings, not liable to receive injury, and tertiary colors, or broken hues and tones, suggesting at once strength and fitness.

Having determined, then, the general character of the ornamentation, whether relief or surface, and the general distribution of the decorative forms, we must next consider how the design is to be carried out : whether it is to be cast, modelled, carved, or embossed and chased, on the one hand, or stencilled, printed, pencilled, embroidered, woven, or inlaid, upon the other. A knowledge of the technicalities of any craft is necessary, in order to produce a design to be executed by that craft, having the merit of adaptation, and even of practicability ; and the character of the product, as well as its merit, depends largely upon the timely consideration of the desired results, and how they are to be attained. The finished product, then, is valuable in degree, other things being equal, as knowledge or ignorance has been the motive power. In the consideration above referred to, the effect of light and shade should not be overlooked ; for whether the ornament is surface or relief, or a mingling of the two, light and shade are two of the most important factors to be considered and calculated.

Again, if colors are to be employed at all, we must consider the purifying and strengthening, or the impoverishing effects produced by their juxtaposition one with another. A thorough knowledge of the harmony and properties of colors, not only theoretical but also experimental and practical, must be the basis of harmonious color effects.

Finally, as ornament must be applied to every variety of surface, plane, cylindrical, conical, and spherical, and to modifications of these and other surfaces, it is absolutely necessary that the designer should be able to shape his patterns to fit any required surface, in order that the applied design may not be deficient in distribution and continuity. This involves a knowledge of projection drawing in some of its higher applications.

In fact, no knowledge, either theoretical or practical, whether belonging to the special domain of physics, ethics, or æsthetics, whether scientific or metaphysical, can come amiss to the true decorative artist. It is not the profession that exalts the man, it is the man that exalts the profession, and his kingdom is what he makes it. In its possibilities his kingdom is literally the world, and not only may his skill awaken the admiration of him who pays for it, but that of every beholder, not only in the fleeting present, but through all coming ages, even as we of the present generation admire the ancient Egyptians in their admirable system of ornamentation, executed at a period to which the Dark Ages are but as yesterday. The art of the designer appeals at once to the most ignorant and to the most enlightened,—it is a key with which every heart can be unlocked; and with him, more truly, perhaps, than any other, it may be said that “knowledge is power.”

XXI.

REPRODUCTIVE PROCESSES.

FOR the transmission of ideas, two modes only, beyond that of touch, have been open to mankind, — one, and the more common, that of sound ; and the other, hardly less important, that of form and color. It is with this latter mode of expression that we are to deal.

Passing by the crude efforts of the first few centuries, we find the exchange of ideas taking a tangible form in China in the shape of printing, somewhere about 900 B. C. ; and two thousand years later the monks of Europe are known to have worked from roughly-engraved blocks what are termed block-books. Later, about 1430, Gutenberg and his associates developed the process of printing from movable types ; and in 1452 Maso Finiguerra, a Florentine jeweller, accidentally discovered that impressions might be taken from engraved metal, on sulphur. A wood-cut of St. Christopher carrying the infant Jesus across a stream, was made in 1423 ; and one of the Virgin Mary, surrounded by female saints, bears the still earlier date of 1418.

From this time the kindred arts of printing and engraving made rapid strides, and it is by no means probable that the zenith of excellence has yet been attained.

The art of engraving is naturally divisible into three branches, — wood, metal, and stone, the respective technical names for which are xylography, chalcography, and lithography. Of these we shall speak each under its respective head.

Wood-engraving is now uniformly executed upon blocks of boxwood, cut across the grain into pieces one inch thick, and planed smooth on the face. Blocks of from six to eight inches square can be easily procured ; but for larger subjects, two or more may be joined together.

Before executing a design on wood, the face of the block is slightly covered with Chinese white, which, when dried and brushed, offers a fine white surface to receive the drawing. This is either made in pencil on the block, or is transferred from the original drawing by tracing. The tracing is drawn with a soft pencil ; it is then placed face down upon the block, and gone over with a hard pencil ; or it is transferred by “throwing down” the ink from the moistened surface of another wood-cut.

Assuming that an original design is to be made, the draughtsman executes

it on the prepared block, mainly with his pencil; but when the character of the work will admit, portions are executed in India ink, care being taken to let each wash dry before another is applied. Wherever this method is pursued, the artist afterwards must rule the surface so washed with a series of fine lines in lead-pencil, otherwise the graver may wander from the desired direction, and give a false and uncertain tint. The block is then passed to the engraver, who cuts away all those parts of the boxwood which the designer has not covered, following every line of the artist's drawing, as he cuts away the whites and leaves the blacks, or, if it is an India-ink drawing, he labors to reproduce the artist's effect by a judicious combination of wide or narrow cuts, his degree of success being limited only by his artistic capabilities and manual dexterity.

Another mode of engraving on wood consists in printing the ground on black, while the drawing-lines, which are cut away on the block, are left white in the impression. This mode is exceedingly effective for outline and mathematical drawings, to which it gives a striking relief; it is also more cheaply executed.

Still another mode of engraving drawings on wood consists in the use of two, three, or more blocks: the first receives the outline of the form to be produced the second the tints and half-tints, while the white surface of the paper is reserved for the lights. We must observe that by the aid of an exact "register," the second printing is taken upon the first impression. The first block gives the print the appearance of a pen sketch, and the second that of a washed drawing. We have now considered the process by which two blocks are used and three tones obtained, — the outline, the shadow, and the light. This is the simplest mode of working; later, by means of a greater number of blocks, the tints are multiplied and numerous gradations obtained.

COPPER-PLATE ENGRAVING.

This process is diametrically opposite to that employed in wood engraving. In the latter, all that is to be dark in the impression is left in relief, while in the former the dark lines are cut into the metal plate, and damp paper is subjected to so much pressure against the plate, that it takes up the ink from the hollows. Having made a correct drawing of the composition or figure to be produced, the engraver transfers his design to the metal by means of an exact copy on tracing-paper, which gives the outline, the strong shadows, and the half-tints. This done, the artist begins to trace the outlines with a point to a greater or less depth, according to the amount of light required. These first strokes form the foundation of the subsequent work, and require the most correct and careful drawing.

Copper-plates for engraving must be of very pure metal, and well burnished, or hammered plane and polished, so as to give hardness and uniformity to the surface.

Steel engraving, as now practised, is substantially the same as copper-plate engraving.

ETCHING.

The process of etching as at present executed is conducted as follows : —

The engraver first furnishes himself with a prepared plate, and after heating its surface, coats it with a black varnish or wax. He then makes a tracing of his drawing in gelatine and transfers it to the surface of the varnish, after which he follows the traced lines with a needle, cutting through the varnish to the surface of the metal. A “dam” or rim of wax is then turned up around the edge of the plate, and diluted sulphuric acid is poured upon it. The acid is occasionally disturbed with a soft brush, that it may bite the exposed metal evenly. At length the acid and varnish are washed off, and where necessary to give the requisite sharpness of detail the lines are retouched with the graver, and the work is done unless re-biting be necessary.

By this method, which is really one of combination, it will be seen that if properly manipulated the soft tones of etched work, and the sharp effects of line engraving, may be joined with admirable effect on the same plate.

MEZZOTINT ENGRAVING.

In mezzotint engraving the copper or steel plate is scraped with an instrument called a cradle or rocking-tool, which requires careful use. It is a semicircular steel instrument roughened at one end, the asperities of which penetrate the surface of the metal, and produce numberless little dents, very near each other. When the surface is equally indented with this rocking-tool, a scraper is used to soften the ridges more or less as the lights are to be stronger or fainter, and to remove them entirely when high lights are required. This is quite a different operation from that employed in other kinds of engraving. Instead of merely drawing all that is to appear shaded in the impression, those parts only are worked which are to be removed or softened. The mezzotint process gives imperfect results if not carefully managed, as careless manipulation of the rocking-tool will produce spiritless and confused effects. The transition from light to shade may so easily be slurred over, that the greatest precaution is needed in order to obtain good and pleasing gradations of tone. Another thing which discourages from the use of mezzotint is, that the plate will not yield many impressions. After a few hundred impressions have been taken from the plate, its roughness, which gives tone to the impression, becomes crushed in the press, and in some parts disappears altogether.

Mezzotint was invented by Von Segen, improved by Prince Rupert in 1648, and by Sir Christopher Wren in 1662.

Aquatint engraving resembles mezzotint in its results, and is often confounded with it; but it is in reality quite different. Instead of first indenting the plates with the rocking-tool, the engraver begins by tracing the outline of his design on the bare plate, which he then sprinkles equally with very fine sand or resin, from a sieve. Of the two, sand is preferable, as it adheres readily to the plate when slightly warmed. Acid, slowly but plentifully poured

upon the surface thus prepared, corrodes all the imperceptible spaces between the grains of resin or sand, and the mass of similar and equidistant dots gives a soft and harmonious appearance to the impression. The tones produced resemble that of India-ink or Sepia drawings. The process was introduced into England by Paul Sandby, and has been practised in this country with success.

The chalk style was invented by François and Dumarteau, although the origin may be traced back to John Lutma.

The imitation by engraving of the effect of chalk on the grain of the paper, allows of the multiplication of accurate and excellent fac-simile copies of the handiwork of the great masters, which are very useful as models and guides to young artists.

To obtain these fac-similes the engraver uses a revolving wheel, or roulette, which is a small cylinder of steel turning on an axle fixed to a handle, and proportioned to the size of the stroke about to be produced. The outer part of this little wheel is covered with sharp teeth, which bite into the varnished copper in several places at once. When the aquafortis has acted on this first work, the artist, with the same instrument, retouches on the bare copper those parts which he wishes to mark more strongly. A tool with the end unequally roughened, which produces similar effects to the roulette, is sometimes used. To give the appearance of drawing in red or bistre, the greater number of François and Dumarteau's engravings were printed in red or brown.

Lithography, or the art of printing from stone, was invented by Aloys Senefelder, at Munich, about the end of the eighteenth century. It consists first in writing and drawing on the stone with the pen, the brush, the graver, and the crayon, or in transferring to the stone writings and drawings made with pen and brush on transfer paper, or impressions from copper, steel, and pewter plates taken on a coated paper, and then in printing from the stone the writings or drawings thus made upon it.

The principles of the art are these: An unctuous composition having been made to adhere to a calcareo-argillaceous stone, those parts covered by it—*i. e.* the writing or drawing—acquire the power of receiving printing-ink; while those parts not so covered are prevented from so doing by the interposition of water. An absorbent paper is laid on the stone, and when subjected to strong pressure, copies are obtained.

The best lithographic stones are found at Kelheim and Solenhofen, near Pappenheim on the Danube, and in Bavaria; but they have been found, also, in Silesia, England, France, Canada, and the West Indies. These stones are composed of lime, clay, and silicious earth, and are of various hues, from a pale yellowish white to a light buff, reddish, pearl-gray, light gray, blue, and greenish color. Those of uniform color are the best. The buff ones are soft, and are adapted for lettering and transfer; the pearl-gray ones are harder, and are used for chalk-drawings and engravings.

The stones are ground plane with sand, and when intended for the pen, the brush, the graver, or transfer, they are polished with pumice and water-of-Ayr stone. An artificial grain is given by ground glass or fine sand.

When any writing or drawing upon stone is to be etched, a mixture of two parts of nitric acid and from forty to sixty parts of dissolved gum-arabic is poured over the stone once or several times, according to the nature of the work. The etching changes the nature of the stone, raising the work on it to a degree scarcely perceptible to the naked eye. The writing or drawing, which has been effected by greasy ink or chalk, is protected from the action of the acid, and the protected parts retain the qualification of receiving printing-ink which is the natural property of the stone. When the printer wets the stone before applying the inking-roller, the water enters only those parts of the stone which have been affected by the acid, while the ink adheres only to those parts, however fine, on which the acid cannot operate, owing to the composition of the ink or chalk with which the drawing or writing has been done, and which, being greasy, rejects the water.

When the drawing or writing with ink on a polished stone is completed, the etching is proceeded with, and a portion of the etching composition is allowed to dry on the stone. The printer then adjusts his stone on the press, washes off the dried gum, removes the whole drawing or writing with turpentine, wets the stone with a sponge or damping canvas, then applies his inked roller and rolls it several times over the stone till the lines appear again. When sufficient ink has been applied to the lines, the paper is laid on the stone, drawn through the press, and the impressions are taken. The damping and inking of the stone are renewed for every impression.

Chalk-drawings are done on the ground-stone with chemical chalk, with the stump and scraper, and sharp inked lines. If boldly and systematically treated, by giving the effect first and detail afterward, richness and softness of appearance will be produced and a great many impressions may be taken.

Tinted drawings, chromo-lithographs, and colored maps require as many stones — grained or polished — as there are various tints or colors, one stone being printed after the other, and so fitted and blended together as eventually to produce the desired effect.

From the foregoing it will be clearly seen that the more the talent of the artist and the skill of the artisan are combined in one person, so much the more surely will he succeed in any of the forms of reproductive art. An exquisitely drawn block that has fallen into the hands of an expert engraver, of long experience, may not have when engraved the effect intended; for if the engraver follows each line with all the fidelity of an unthinking machine, the result will be hard, spiritless, and unmeaning. The same block in the hands of a less expert engraver, who has some artistic taste and training, may be cut in such a manner as to preserve the draughtsman's sentiment and produce a more pleasing effect, though in a strictly mechanical sense it may be a mediocre engraving.

Happily, art education is now coming within the reach of all; and as soon as its advantages are more generally appreciated and accepted, there can be no doubt that it will do much to elevate and refine mankind.

XXII.

THE APPLICATION OF PHOTOGRAPHY TO
ENGRAVING.

ALTHOUGH our ancestors of the eighteenth century quote, as a matter known in their childhood and recognized as an undeniable fact, that the sun "made linen white and maidens dun," another matter, not less important, seems to have escaped their observation until towards the latter part of that century, *i. e.* the peculiar effect of light on compounds containing silver.

The first philosophical examination of this effect was made by Scheele in 1777, while trying the effect of the different rays in the solar spectrum on nitrate of silver, then luna cornea. By arranging a glass prism in a window, and throwing the refracted rays on a paper covered with luna cornea, he not only found that the substance was changed in color, but that the different rays differed in degree of action, the violet rays being the most active.

In 1802 Wedgewood published an account of experiments leading directly to the successful results since attained. He saturated white paper or leather with nitrate of silver, and exposed it in the camera, or under leaves of trees and wings of insects. The result was that the objects kept the part covered by them white, while the parts exposed to the light became darkened. Thus a most successful picture was formed ; but alas for the instability of chemical things ! no means were found to preserve the white, and when once the opaque body was removed, all became black together. Sir John Herschel and Dr. Fox Talbot were as eager as Wedgewood to find some bath that would make the ghost a tangible presence, and Sir John Herschel found it in hyposulphate of soda.

In 1814, M. Niepce, of France, afterwards the partner of the well-known Daguerre, produced the first permanent pictures by solar radiation, permanent in a very temporary sense, as experience has taught us. He coated plated silver or glass with a varnish of asphaltum dissolved in oil of lavender, drying without light or moisture ; he then exposed it in the camera from four to six hours. At first a faint image alone was visible. This was developed by immersion in oil of lavender and white petroleum, and subsequently washed and dried.

Daguerre went back to the old process of using a silver compound, think-

ing Niepce's process too slow. To think now of photographs taken only after a sitting of six hours, is to bless Daguerre for his dissatisfaction! But to M. Niepce belongs honor for another reason, which places him on a plane fully as high as that on which M. Daguerre stands, although his name has failed to attach itself to any special process. This is the honor of originating the idea of a printing-plate, which, by photographic process, would give an indefinite number of truly permanent impressions. He discovered, during his many experiments previous to 1827, that thin plates of bitumen were curiously affected by light; so he coated metal plates with a thin layer of this substance, and exposed them in a camera for several hours; the plate was then submitted to the action of oil of spike, which dissolved the parts not acted on by light, but acted little on the rest. In this case the part dissolved represented the dark parts of the picture, and the remaining the light parts. Acid was then applied, which acted on the uncovered metal, but not on the bitumen, as in etching. The objection to this plan, if successful in manipulation, must have been that it would produce pictures with harsh contrasts, the dark parts being of too uniform depth, and middle tints hardly expressed, save by subsequent finishing by hand, would offset a process involving more labor than the gain by photography.

In 1837 Mr. Fineau used certain acids in a daguerreotype picture which attacked the dark parts of the picture in greater or less degree, according to the intensity of the shade. He did not obtain sufficient erosion to print from the plate, but he ingeniously deepened the engraved parts by oiling the whole plate, wiping off the surface oil and allowing the engraved parts to remain filled with it, and then electroplating with gold until the required depth was obtained. The plate was then boiled in an alkaline solution to remove the oil, and being too soft for printing purposes, was afterwards electrotyped.

In the year 1839 Ponton found that bichromate of potash contains chromic acid, and that chromic acid, when combined with organic matter, is reduced from a high oxide of the metal chromium to a low, and that the oxygen with which it is combined becomes united with the organic substance. He experimented on paper successfully. In 1840 Becquerel claimed that the size on the paper caused the effect, and Dr. Talbot first decided gelatine to be a superior substance for the reduction; he also found that the gelatine, by the process, became tough and insoluble. Subsequent experiments in photographic engraving rest on this principle.

Knight says, that Joseph Dixon, of Jersey City, was the first to use organic matter and bichromate of potash for lithography. Poitevin was the first to discover that the organic matter, under the influence of the bichromate and acted on by light, would receive ink from a greasy roller. In 1856 he patented a process which consisted in coating a stone with a layer of gelatine and bichromate, and exposing it to a luminous object. The parts acted on by light become insoluble and refuse water, while the parts not acted on by light absorb it. In turn the parts refusing water receive the greasy ink, and the moist parts refuse it. One objection to this process lay in the fact that if the impression were taken from a positive picture, the stone would

exhibit a negative, and if printed from a negative, the light and shade would be right, but the right side would exchange places with the left, reversing the position of the picture. Also, as the gelatine absorbed the water before the application of the ink, it became swollen, raising the surface above the non-absorbing parts, and thus the dark portions which needed the strongest action of the press received the least, while the moist parts were easily crushed and destroyed. On this account this process has been little used.

Dr. Talbot, in 1852, and again in 1858, patented a process called *photoglyphic engraving*. This consisted in dipping a steel plate into a solution of sulphuric and acetic acids, and then coating it with a solution of gelatine and bichromate of potash, to receive the image. The effect was the same as that resulting from Poitevin's experiment; but instead of printing from the gelatine, he found that a weak solution of bichloride of platina would eat through the gelatine where the light had not acted, biting the steel plate. He therefore removed the gelatine when the etching was sufficiently deep, and his plate was ready for use.

Mr. W. E. Newton substituted gum and sugar for the gelatine, and used a lithographic stone. He exposes the coated stone under a negative which affects it in much the same way as the gelatine. He then removes the soluble portion by washing with a solution of soap, which also has the effect of giving a good surface to the remainder for receiving the ink, while in Talbot's process the etched portion of the plate underneath the soluble gelatine receives the ink, and forms the dark part of the final picture. In Newton's process the insoluble parts receive the ink and furnish the shades; hence in the first case the impression comes from the image, in the second from the negative. Attempts have been made to apply photography to wood-engraving, which, although ingenious, have given no practical results, either immediate or probable; so I pass them by.

M. Pretsch, of Vienna, has invented a method called *galvanography*, dependent on the same principles established by Ponton, Poitevin, and Talbot. He coats a glass in the same way, with the same results, and obtains his picture in relief, the parts which absorb water rising above the insoluble dark parts. From the image thus formed a *gutta-percha* mould is made, and from this mould an *electrotype* copper-plate is formed.

In the *Woodbury process*, the same gelatine picture in relief is placed under a sheet of soft metal and subjected to great pressure, the metal giving the form in reversed relief and depression. This mould is then filled with colored gelatine, the paper on which the picture is desired is placed over it, and a level pressure brought to bear on the paper, which removes all superfluous gelatine. The depressed parts, which represent the dark parts of the picture, retain the most gelatine and color; and when the paper lifts the gelatine from the mould, a picture in almost imperceptible relief is left on it, but with decided differences of shade. This method was used in illustrating the "*Medical and Surgical History of the War*" "with excellent results." Hitherto the process has been applied only to small pictures.

With nearly similar results, but by quite a different process, we obtain

carbon-prints. In the Woodbury process it will be seen that the first-formed picture must be negative, or, rather, taken from a positive, since the raised parts in that must correspond to the depressions in the mould, or the dark parts in the final picture; but in the carbons the impression is taken from the negative, the picture itself being positive in regard to light and shade, but reversed in position. The impression is taken on paper coated with bichromate of potash and gelatine, with which has been mixed some pigment, as carbon. It will be seen that the light, acting through the light parts of the negative, affects the sensitive surface beneath, — probably through its entire thickness, — but in the most opaque parts the character is not changed, and therefore it remains perfectly soluble, while in the intermediate parts it is affected to a depth precisely in proportion to the intensity of the shade. But we have no picture, — only a sheet of blackened gelatine, and to bring it out we must remove the under surface of unaffected gelatine with the accompanying color. At first this was done by washing the picture in hot water; but the insoluble part, being nearest the paper, on being dissolved, left the upper surface, detached from the paper, floating on the water. To prevent this, the paper, before the application of hot water, is firmly glued, face downward, on another paper, which fixes the insoluble parts on the second paper; then hot water is applied, which detaches the first paper, and thus brings the soluble parts to the surface, where they also are washed away. Mr. Edwards says, "It is difficult to conceive that anything can be finer than Braun's reproductions of the paintings in the Sistine Chapel; and each one of these consists of a film of bichromated gelatine, in which any convenient coloring matter is imprisoned."

Knight considers Osborne's process of photo-lithography the first thoroughly successful one. This is in use, with slight modifications, for government work both in England and America. It was first patented and used in Australia, in 1859, for the preparation of maps for the Crown Land Surveys. Osborne combines the bichromated gelatine with albumen; he obtains the usual results by exposure to the negative, but instead of applying water at once to remove the soluble parts, he covers the whole surface with a lithographic transfer-ink, then floats the sheet, ink side up, on hot water; by this process the albumen thickens and forms a supporting film, which assists the manipulation of the sheet during transfer. The gelatine as before swells where not affected by light, and a picture in relief is obtained. Light and shade are gained by removing the superfluous ink, which is repelled by the water-absorbing parts. The precise method pursued by Osborne at this point I have not been able to learn, but the Southampton method, nearly if not quite identical with his, and patented by M. Asser of Amsterdam at nearly the same time, is as follows: The print is removed from the water to a glass plate, hot water is poured gently over it, and the soluble gelatine is removed by careful rubbing with a soft sponge, soaking and rubbing until every particle has disappeared. The print is well washed in cold water and dried; it is laid face downwards, when thoroughly dry, on a previously prepared warm lithographic stone, slightly damped on the upper surface; papers are laid upon it, and the

whole is passed several times through a press, each time with added force, until the impression is firmly fixed to the stone ; all superfluous matter is then removed, the stone is slightly etched (to prevent the spreading of lines) by weak nitric acid, and the stone is ready for the press. It seems plain that this method may give firm lines, but can give no fine gradation of tint, which is necessary to a good picture ; hence this process is specially adapted to the very work to which it is now extensively applied, — plans and maps.

We find, then, that the chief obstacles in the way of all the processes save Woodbury's and the carbon printing, is, that on the removal of the soluble gelatine, whether the remainder is used to print from immediately or is used for the formation of a mould, there is always the same harshness of contrast. When the swollen gelatine is allowed to remain, the depressions which receive the ink, and specially require the action of the press, fail to receive it, while the swollen parts, by constant absorption of moisture and extra wear in the press, become crushed and useless after a few impressions.

Carbon printing gives us the desired results in these respects, but by its means we obtain pictures slowly, one at a time, the impression being taken each time, and the whole process of fixing, glueing, and washing gone over with each picture. The Woodbury type necessarily repeats the whole process subsequent to the formation of the mould with each picture, and so neither of these processes can be used for the very rapid multiplication of pictures, however good they may be.

Attempts at improvement were made by using a very thin layer of gelatine, but the gelatine was easily crushed and the pictures weak.

Albert of Munich mounted the bichromated gelatine on a glass plate, and subjected it throughout to the action of light, so that the whole sheet became insoluble ; then over this he placed a very thin layer to receive the impression. Thus he hoped to make a strong film, without the undesirable relief. The glass was liable to fracture ; but Mr. Edwards says, that although the pictures were wanting in strength and robustness, he was convinced, on seeing them, that in that direction lay the future of permanent photographic printing. Thereupon he discovers a means of doing without the glass, and also of obviating the difficulty about the swelling of the gelatine ; he finds that the gelatine is affected by chrome alum, and that it is converted into an insoluble substance, by the action of light ; he also finds that the alum in no way interferes with the action of light on the bichromated gelatine, and yet that the parts unacted on by light retain the power of taking sufficient water to repel grease, — at the same time producing no relief that interferes with perfect printing. The gelatine can be sufficiently thick and tough to allow from 1,000 to 1,500 impressions to be made from one plate without loss of quality. Common cooking gelatine is dissolved in hot water, bichromate of potash and chrome alum added, and the solution poured on a plate of glass or slate which has been previously rubbed with wax dissolved in ether, to prevent the too close adhesion of the mixture. The plate must be kept, as in all previous cases, from the actinic rays of light until exposed under the negative. Deep orange glass is recommended in the drying-room. When dry, the sheet is detached

from the plate and placed in contact with a reversed negative, which contact can be established more perfectly and with less trouble than when the film is mounted. When the impression is sufficiently strong, the film is placed under water, with a metal plate suitable to print from (nickelled steel, zinc, and pewter are named), and when the water has expelled the air between them, the "squeegee" removes the water, and the film is firmly held to the plate by atmospheric pressure. This squeegee is simply a strip of rubber in a wooden frame, which, by a slight, quick pressure across the film, removes every particle of water and air that may prevent a firm union to the plate. The plate is then soaked in water to remove the bichromate, so that light can no further affect the film, and is ready for the press. The film can at any time be removed from the plate, and, when required, replaced with little trouble either of storage or labor. In inking another improvement has been made, which is claimed "to give a value to heliotype printing possessed by no other method of printing in existence." "If," says Mr. Edwards, "in inking one of these plates, we use what is called a very stiff ink, we shall find that it will adhere only to the deepest shadows: if we use a very thin ink, we shall succeed in printing the delicate half tones, but shall no longer get depth in the shadows. My method is to get two or more inks of different intensities in succession, — to begin with a stiff ink and continue with a thinner. To produce different effects, the colors of these may be varied; as, for instance, black in the stiff ink, and above this a thinner purple or brown, which will give us the half tones." It should be stated that the surface of the plate must be damped previous to each inking, and a good effect is obtained by damping with water slightly tinted. After inking with a roller of gelatine or rubber, a matting is placed around the part which is to be printed, the paper on which the print is to be left is placed above it, and a vertical pressure is brought to bear on the plate. On removing the paper, the picture has a clear margin, owing to the matting, and all the trouble of subsequent mounting is dispensed with. This is a great advantage as regards cheapness, and also because it gives an even surface for book illustration, to which the process seems specially adapted. As with all photographic impressions, color cannot be truly expressed, neither can engravings discolored by age be effectively reproduced. Pictures dependent on light and shade and form can be well represented. Mr. Edwards thinks it probable that there will be a "distinct class of artists who will translate color into light and shade" for this very purpose.

XXIII.

GLASS—CAST, CUT, AND ENGRAVED.

WHEN glass was first made or invented is unknown, although Pliny tells us of its accidental discovery by some travellers in Syria. Having made a fire on the shores of the river Belus, its heat incorporated the salts contained in the herb kali with some of the sand of the shore, and formed glass, which was then observed for the first time. Other authorities, some of them noted chemists, say that the possible quantity of heat so generated could not have produced such a result, for in our days it can only be brought about by furnaces constructed for the purpose. It is difficult to realize how sand could have become so fusible, no matter how soft the flux or alkali might have been which happened to incorporate itself with it. Other materials, however, might have produced such an effect under similar circumstances.

Borax can be melted in a crucible in a common stove, with a hot fire, and when poured out and left to cool will form a clear and transparent glass, but not a durable one; lead, in the state of an oxide, fused with it, will also form a yellow glass. The words "transparent glass" have been used, but glass ware is not always so: opal glass, for instance, is so much like porcelain that it is difficult to tell the difference, and it is in consequence often called porcelain glass; jet black glass is often and easily made, and we all know that bits of glass of different colors have been used in mosaics from very early times.

Scott also tells us that glass-making dates from far beyond the historic period, and that curious things can now be seen in museums which were in request by the Egyptians, proving that the vitrification of colored substances is as old as the pyramids; other curious objects, found in the Catacombs, are also preserved in the Vatican at Rome. The celebrated Portland vase is a magnificent specimen of ancient glass. The Greeks are supposed to have engraved on glass, and to have known the use of the wheel used for cutting it, and many specimens of ancient glass with raised figures are preserved, which were probably moulded.

Glass was made at Venice as early as the twelfth century.

From early times to the sixteenth century, glass-moulding was unknown; at this time, however, Carillon reinvented the iron mould, and bottles of glass thus shaped were made in sufficient quantities to replace the leather ones previously imported from England.

Before glass can be moulded, it must be in a molten state: that is, its ingredients must be in a thoroughly fused condition, and in a liquid form of sufficient consistency to be conveniently worked. Red lead and fine sand are important ingredients in making superior glass; the lead must be pure, and as this is somewhat difficult to obtain, large manufacturers find it cheaper to oxidize their own lead; this is a very unhealthy part of their business, and workmen engaged in it live but a few years after making it their vocation.

The sand used by some of our manufacturers comes from Berkshire County, in the Western part of this State. Lime and oyster-shells are used in making cheap glass, but no lead, and it is called lime or oyster-shell glass, as the case may be. Glass without any lead in it cannot very well be used for cutting, as it is dense and smooth, and being naturally soft, grinds away easily at the touch of the cutting-wheel; it is, however, capable of a very fine polish. The materials for making glass are put into clay vessels with dome-shaped tops, larger at the top than at the bottom, circular in section, and with height greater than their diameter; an aperture near the top, which projects like an attic-window from the roof of a house, is used both for putting in raw material and taking out the molten glass. These pots are from one to three feet in height and two to three inches in thickness, the bottoms being four inches thick. These pots are placed in a furnace called a cone, circular in form and running upward like a very wide chimney. The fire in this furnace is kept at a white heat; the pots are placed around the inside, the apertures opening outward. When the material is thoroughly fused and ready for use, a workman, called the gatherer, stands before the hole, and gathers on the end of an iron blow-pipe a quantity of the molten glass; this he passes to another workman, who, by swinging or by other movement, works it into an ovoid or spherical shape, according to the shape of the article to be made; it is then put into a hinged iron mould, with long handles attached. After the glass, which is still attached to the blowing-iron, is put into the mould, it is closed, the blower blows through the hollow iron tube, until the glass is blown outward and into the crevices of the mould. It of course instantly cools and becomes solid. It is then taken from the mould, freed from the blowing-iron, and carried into the annealing furnace. By sinking it into the mould, elaborate designs can be made to appear in relief on the moulded glass. Glassware made in this way is often overloaded with ornament, as it is as cheap to cover the surface entirely as to cover it partially. This kind of work is sometimes mistaken by many for genuine cut-glass. The difference can, however, be easily discovered by the round edges of the moulded ornament, and the sharp and decided ones of the cut; and again, the moulded glassware shows the seams of the mould, as a mould which opens and shuts on hinges, however tight the joints may be made, will show seams on any moulded article. To obviate this, wooden moulds have been introduced, and are used where they can be to advantage, in the same way as iron ones. To make it practicable to use the wooden mould, it is kept immersed in water, and dipped into it every time an article is made. The glass is put into this mould and blown in the same way as in

the iron one, with this difference: the blower turns the tube round as he blows through it, the seams running vertically and the movement of the article being horizontal. Every trace of a seam is thus destroyed. Articles made in this way are as good as those blown without a mould. All cylindrical, conical, ovoid, or spherical shapes, or these mixed, can be so made, such as bottles, globe-shades for gas, cone-shades, lamp-chimneys, and a variety of other things.

The art of cutting glass is believed to have been invented by Caspar Lehman, who took out a patent in 1609. He was in the service of the Emperor Rodolph, and was lapidary and glass-cutter to the Court. Before this time figures had been admirably engraved upon glass by the use of diamonds. Even at a later period, in 1760, Wedgewood imitated the Portland vase, already alluded to, by the same method. Another method also seems to have been known of cutting glass by means of emery powder and sharp-pointed tools. Glass-cutting by our present method was not of much importance until the end of the seventeenth century. It is done by vertical wheels of different substances, turned by hand, steam, or water power. Four kinds of wheels are successively used. The first wheel is iron, and cuts or grinds the design very roughly upon the glass. Sand and water drop upon this wheel from a trough above. This trough is often in the shape of an inverted pyramid, the water and sand dropping out of it at its apex. The best cutter or workman is employed in this stage, as the drawing or shaping of the design has to be done; the work done afterwards is merely smoothing, and little or no artistic skill is required. The wheel next used is made of sandstone, and water only is used upon it; the third is made of willow-wood, on which emery and putty are used; the fourth and last, which is made of cork, is used with putty only, to put on a very fine polish; this putty is an oxide of tin and lead. Ornamenting glass by this method is the most useful and perhaps the most elegant; for nearly every piece of glassware can be thus improved in appearance. Its application is very wide. Upon flint glass ornamentation has scarcely any limits.

Cutting makes glass very brilliant: the ornament is sharp, the outlines are well defined, and the designs may be of great artistic value. Articles are often made of glass composed of different layers or coats, and each of these coats may be of a different color, which, when cut through, shows an outline of various colored threads. When the glass is evenly coated, as it always ought to be, these threads are marvellously true. When two coats only are blown, the first one is cut through, leaving the ornament of one color, while the glass forming the ground is of another. It has not been definitely ascertained when small wheels were first used for engraving; but as cutting and engraving have always been done at the same period, and in similar ways, it seems that the use of wheels in one case might have suggested the use of them in the other. The copper wheels now used for engraving, are from three inches to one quarter of an inch in diameter, and even less; some seem to be merely a point. Copper is considered the best material to make them of, as it is not too hard or harsh to the glass, and yet is hard enough to make every

impression necessary upon it. The wheels, as in cutting, are placed vertically, and are run by foot or other power; oil and emery are used on the wheels. In cheap work the forms or designs are roughly ground upon the glass without the least attempt at modelling, often leaving the outline rough and ill defined; in finer and more expensive work the modelling is done more carefully, and the work is much smoother and more polished. It is surprising what fine work can be done with circular tools. Figures can be executed on a very small scale, and great attention is sometimes paid to the engraving of animals. The slender form of a greyhound, distinctly showing the anatomy, has been engraved on a space of about three quarters of an inch in diameter. Though all figures are sunk, they have the appearance of being in relief.

A new method of engraving on glass was made known in 1771, and was published as one of Scheele's experiments. Schwanard, however, had discovered it before, but had never made the process known. It is by etching, and is properly so called; in this country it is called embossing. The process is simple, and very much like copper-plate etching.

As it is well known fluoric acid will dissolve glass, it is generally kept in rubber or leaden bottles; a paint is mixed with it. The proportions of the mixture are kept secret, each individual using a somewhat different mixture. Asphaltum and red lead are the principal ingredients. Etching on glass may be done in two different ways. The glass to be etched may be covered with the mixture, or color as it is called in the workshops; the design is then scratched through the color with a sharp instrument, leaving the glass bare where the tool has passed over it; it is then immersed in fluoric acid, where it remains for a short time. During this time it should be carefully watched, and taken from the acid before the glass is too much eaten away. The color is then washed off the glass with spirits of turpentine and sawdust; the raised surface of the glass may then be roughened by rubbing it over with emery powder and water, leaving it white and somewhat opaque, while the ornament remains clear. Another way, and the best where it can be done, is to trace the design upon the glass with a camel's-hair pencil well loaded with color, and subject it to the same treatment as before. In this case the ornament will be raised, and, after the roughing process, white, the glass or ground remaining clear.

If the ornament is traced round, and filled in with color, it will be sunk. The ground will then be rough, and the figure clear. This process is well adapted for large work, such as lights for windows and doors, as it gives the designer a fine chance for bold treatment, and teaches the good workman to draw bold curves, which he does with surprising accuracy. The parts of the glass left clear may be made dull by using acid prepared for that purpose. Such glass freely admits light, but cannot be seen through; this quality makes it very desirable for vestibule doors, which are exposed to the street. This ornamental work, which is very beautiful and durable, can be damaged only by cutting into the glass. It is very expensive, however; wherefore common cut lights, which are cheaper, are sometimes used instead. Ornamentation is not only applied to flat glass, but also to a variety of round objects, such as globe shades for gas chandeliers, cone-shades, lamp-chimneys, and table-

ware. Glass shades of all descriptions are imported from England, France, and Germany, and are considered very beautiful. German work is the cheapest.

It will, perhaps, not be out of place to mention another method of ornamenting flat glass, which gives it somewhat the same appearance as if it were embossed, though it is very inferior, being done on cheap glass, while embossing is always done on plate glass. A mixture is made of lampblack, whiting, and a little gum-arabic, and with it the design is traced on the glass; a white pigment is then laid on, covering the surface of the glass evenly; it is then placed in a kiln, and the white burnt in. Burning, however, does not fasten the black mixture to the glass, for it is easily rubbed off when it comes out of the kiln, leaving the ornament bright and clear. It has been done for years by the means of stencil plates, which are used to lay on the mixture. The article is cheap and durable, but does not look well.

XXIV.

POTTERY AND PORCELAIN.

POTTERY is classed as hard and soft paste. Hard paste is that which cannot be scratched with a knife ; it is opaque and translucent, and is divided into fine earthenware and stoneware.

Fine earthenware is composed of a white paste, made out of plastic clay, silix, and lime ; its glassy glaze is of lead. It is fired at a temperature of 25° – 100° ,* and glazed at a still lower temperature. This class includes Palissy's and Wedgewood's fine earthenwares.

Stoneware is composed of the same ingredients, with the addition of stoneware cement. The glaze is of sea salt, or lead, or slag from a furnace. The salt glaze is applied but once, the lead twice. The firing requires a temperature of 100° – 200° , and extends from four to eight days.

Under the head of translucent hard paste is included Wedgewood's English soft porcelain. Its material is kaolin, clay, and bones, glazed with red lead, borax, soda, and flint glass.

Soft paste is classed as unglazed, including Wedgewood's imitation of Etruscan vases ; and glazed, — mezzo and true Majolica, which latter includes Della Robbia ware. This ware is composed of argillaceous marl, sand, and potter's clay ; it is colored or whitish, and of earthy fracture ; the glaze is plumbiferous, or stanniferous. It is first baked at a temperature of 675° , and again after the application of the enamel, as it is difficult to lay it upon crude paste.

It will be noticed that hard paste generally requires a lower temperature than soft paste ; and it is called soft porcelain, because it will not bear more than a certain temperature without softening. Silix is used to make the clay firm and keep it from cracking, and when in the form of calcined flints, to impart translucency.

All raw materials for fictile work must alike be reduced to a fine state of self-division, and the paste as a whole must be homogeneous, in order to secure uniform shrinkage. This is done by cutting and grinding the materials, and then washing them until in a state of suspension. The paste when solidified

* The degrees given are according to Wedgewood's pyrometer, which are to those of Fahrenheit as 1 : 7 nearly.

is beaten and kneaded until it is homogeneous, and the air is expelled from it. It is then ready to be formed. If the clay is to take a circular or cylindrical shape, it is placed in the middle of the potter's wheel (invented 1700 B. C.), a horizontal table to which a rotary motion is imparted, while the potter shapes it with his fingers, and with an iron of an inverse outline to that of the exterior surface of the object, at the same time hollowing out the interior. When objects are decorated with raised or incised ornament, the clay is rolled out and pressed in a mould of gypsum or some other material. By means of moulds, cameos, statuary, and Palissy raised work are made. When objects are ready for the kiln, they are usually placed in seggars, or protecting cases, set one above another, to exclude ashes and smoke. To secure as far as possible this latter object, the air for a pottery fire is admitted from above. Notwithstanding these precautions, however, about one fourth of the pottery baked at one time, is distorted or otherwise rendered unfit for sale.

"Porcelain painting is an art closely allied to that of glass painting, the effect being entirely restricted, however, to reflected light, as the semi-opacity of the ware forbids the use of all transparent colors. The pigments are either metallic oxides or enamels and glasses, colored by proper oxides and ground to a fine powder. When it is remembered that the desired tints of color appear only after firing, it will be understood that porcelain painting involves artistic difficulties unknown to the miniature painter. Many of the pigments produce their appropriate tints at a far less intense temperature than that of the baking kiln, while others form compounds so fusible with the materials of the glaze that they flow at a temperature below that required to fuse others. This fact divides the pigments into the easily fusible colors (technically called muffle colors because they require to be fired in an oven or earthenware box, called a muffle), and refractory colors, or those which will stand the utmost heat of the kiln. The latter may be put on with the glaze, or beneath it on the biscuit surface without injuring the smoothness, brilliancy, or hardness of the glaze, while the muffle colors require oxide of lead to make them act well, and are always elevated above the glazed surface; they are sensibly felt as a raised surface, and are more easily worn away. The refractory colors are blue with cobalt; green with chrome; brown with oxide of iron, oxide of manganese, and perchromate of iron; yellow with oxide of titanium, and black with oxide of uranium: all are applied with silicate of potash or soda, as a flux. Violets, reds, and browns of manganese, copper, and iron are refractory colors for hard pottery, though muffle colors for soft pottery. Gold, which is applied to porcelain in the state of fine powder (precipitated by sulphate of iron from its solutions), is made to adhere to the glaze by the addition of oxide of bismuth, rubbed up with thick oil or turpentine. The bismuth oxide fuses with the glaze and causes the gold to adhere so firmly, that it can be burnished with an agate. Silver and platinum may also be applied."

The process of applying refractory colors is this: When the piece, transformed by a first firing into biscuit, has been dipped in the liquid glaze, it is left to dry; then upon the hardened surface the artist traces the figures and ornaments which he desires in vitrifiable colors. This painting upon the raw

glaze requires great manual dexterity, for it is almost impossible to retouch upon a substance which when rubbed scales off and dissolves in water. Placed in seggars with tripods, the ware receives its second firing, which incorporates the painting with the glaze, and gives a softness which no other process can impart. After a second firing, one can paint, efface, and retouch. Upon the return of the object to the kiln, the enamel again becomes fluid, and the colors are incorporated as well as when they were laid upon the raw glaze.

Majolica.—The Moors, being masters of Persia and Egypt, were acquainted with the highest forms of ceramic art. Their pottery is characterized by elegance of form and by the metallic lusted tints of its glaze. Its golden lustre has obtained for it the name of “gilded work.” The decorative colors, as seen in Moorish vases of about 1300 A. D., are few in number. Golden yellow, and a pale blue, encircled or heightened by a pale gold which harmonizes with the azure color of the design, as well as with the cream-white ground, are the principal colors. The decorative patterns are texts of the sacred writings, light scrolls, arabesques, and geometric combinations.

Majolica, one of the Balearic Isles, was the principal seat of Moorish manufacture.

The Pisans conquered the pirate inhabitants of this island 1113 A. D., and brought away a knowledge of their modes of fabrication and specimens of their work. Thus in the twelfth century, ceramic art in Italy received a great impulse. A ware covered with white paste or engobe, through which designs were scratched and glazed with lead, was largely made, and became by amplification, Mezzo-Majolica, the period of which extends to 1450 A. D. This Majolica differs from true Majolica in being a glazed, not an enamelled ware; that is, its whiteness or color is derived from the paste overlying the ground, and not from an enamel. Large, thick, and clumsy plates of a dirty gray, coated on the back with a dull yellow varnish, are of Mezzo-Majolica, and their glaze is of lead, which has a pearly lustre.

The discovery and application of a tin enamel to pottery belongs to the Italian Renaissance. Pesaro and Cafagginolo claim the honor of this discovery, and at the latter place, Luca Della Robbia probably learned the method of applying it. The “secret,” possessed by his family for one hundred years, probably related to the tempering and firing of it in the clay, so as to burn large masses truly and thoroughly. In 1438 Luca Della Robbia executed his famous bas-reliefs of “Singing and Dancing Boys” for the organ-loft balustrade of the Cathedral in Florence. Orders came in upon him so fast that he cast about for a quicker way of filling them than by the chisel. Having modelled a work in clay, he burned it in the furnace, and coated it with an impenetrable and vitrified coating of lead and tin, perhaps mixed with antimony and other minerals. Maestro Giorgio, of Gubbio, made Majolica plates, whose golden yellow and ruby red iridescence, given by a now unknown process, is of great beauty.

The subjects of the early Della Robbia reliefs are chiefly religious, to

which the glistening white of the ware is well adapted. The eyes are blackened, and the figures relieved by a pale, lapis-blue ground. In later works, Andrea Della Robbia introduced moderate tints of green, violet, brown, and yellow for draperies; Luca left the flesh parts uncolored, perhaps because he never discovered a fitting enamel, perhaps that the modelling might be more distinctly seen. The mouldings around his compositions are few, the flowers of simple varieties and in low relief. The enamel he used was thick, liquid, and transparent. By these marks, as well as by his pure Raphaellesque design, Luca's works may be known.

Luca left his work and traditions to Andrea, his nephew and assistant, who made transportable shrines, medallions, and altar-pieces. His technic is skilful and his compositions are pleasing. The countenances are expressive, but mannered; the frames are heavy with cherub-heads, and fruit is substituted for flowers.

Andrea left the manufacture to three of his sons, — Luca, who settled at Rome; Girolamo, who decorated the chateau of Madrid near Paris for Francis I; and Giovanni, an artist of inferior ability. Luca and Girolamo are highly praised by their cotemporaries, but we know little of their work, as, with the exception of a few in the Louvre, the bas-reliefs of the Chateau de Madrid were ground for cement during the Revolution.

From 1450–1700 the manufacture of Majolica was carried on in all the principal cities of Italy. The great factories are classed as follows: Gubbio, Urbino, Castel Durante, Faenza, Forli, Deruta, Chaffaguolo, Venice, and Castelli. Wares from each of these places may be recognized by their peculiarities of manufacture and decoration. The towns under the protection of the Duke of Urbino — Gubbio, Castel Durante, Urbino, and Pesaro — were remarkable for the perfection of their brilliant white glaze, and the metallic iridescence given to their Majolicas by a compound of lead, silver, copper, and gold. In this Gubbio surpassed all the rest. At Urbino the designs of Raphael were applied to Majolica in the best period; hence its designation, "Raphael ware." Il Frate was one of the decorators at Deruta.

The best period of Majolica is from 1540–1560, when subjects were furnished by Raphael, Titian, and other great masters of the Renaissance. Later, the plates are decorated with pictures of ladies and love mottoes. During the decline of the art they were decorated, and trophies, sea monsters, large bouquets, and arabesques were used as ornament. Last of all, Flemish prints were copied upon the ware. The forms in Majolica are distinct, graceful, and few; vases, ewers, pilgrim bottles, and plates, make up nearly the whole catalogue. The making of Majolica was greatly patronized by the Italian princes. Upon the invasion of Italy by the French, the latter were seized with a great passion for enamelled ware, and inferior Italian artists rushed to France, there to make their fortunes. At Nevers, Majolica was first named Faïence, from the natal town of the head workman.

In 1539 there lived at Saintes a man named Bernard Palissy, a glazier and surveyor; he was also a self-taught chemist and geometrician, and had theorized upon artesian wells and the expansive force of steam. This wide-minded man

saw a turned and enamelled cup of such beauty that, though possessing no knowledge of the potter's art, he was possessed with the desire of discovering the secret of its manufacture. He therefore began to grind up materials of all kinds, to build furnaces, and to fire potsherds, but these would not fuse equally, and therefore formed a basis for future experiments. Why he did not repair to Gubbio or Castel Durante, where the mode of manufacture was perfectly well known, cannot be conceived. But after sixteen long years of struggle against all the obstacles which ignorance and poverty threw in his path, he succeeded in making a pottery with a jasper glaze, warmly tinted with brown, white, and blue, thrown in splashes, largely and equally incorporated into each other. The application of this glaze to goblets in relief, salt-cellars, etc., enabled him to live while pursuing further investigations. He then invented a peculiar kind of pottery which he called "rustic pottery." By dedicating this ware to the Queen Mother, and thereby obtaining her protection, he saved himself from the natural consequences of his Protestant heresies. His rustic dishes have a rough arc, strewn with fossil shells, frogs, lizards, and snakes, as well as eels, pike, and trout, swimming in the water. Palissy also engraved patterns upon his dishes, filling their depressions with various colors. After he had been called to Court, and had seen the artistic marvels of the metropolis, he showed a new phase of his talent in the application of human figures to his rustic compositions. His admirable Magdalen kneeling in the midst of shells, and his Charity framed in fossils, may be seen at the Louvre. Palissy also covered the beautiful pewter vases of Briot with enamel.

In material, Palissy ware is coarse and inferior to Majolica; neither is its glaze, of a yellowish tint, as good. Its paste is hard, sonorous, and pinkish-white; the color adheres to it without perceptible thickness, and preserves a remarkable warmth, which indicates firing at a high temperature. The joinings of Palissy reliefs are imperceptible, their forms are fine and ornament good. Palissy often took a mould from the natural object, and applied it to the clay in turn. His pride in honest, perfect work and his knowledge of nature have made his inventions memorable.

The manufacture of coarse pottery had long been established in England. Enamelled ware was produced in 1642. Under the protection of George II (1750-1765), English china was produced, rivalling that of Dresden and Sevres. The first English potteries were not conducted by Englishmen, and died out with their imported directors. About 1710 two brothers from Nürnberg established a pottery at Burslem in Staffordshire. They used the red clay of the district combined with stoneware material. The secret of their process was discovered, and their ware improved by the addition of flint, giving the composition a white color. After this discovery, any desirable tint could be given to the ware by the addition of metallic oxides.

Twenty years after the establishment of potteries at Burslem, Josiah Wedgwood was born there. As Palissy was a naturalist, so Wedgwood was an artist in pottery. His first invention, 1755, was of a green ware, exquisitely modelled in imitation of leaves, and noted for its glaze, fulness and brilliancy of color. He then made small figures, shepherds, etc. To obtain capital for

more classic work he improved the cream-colored ware of the vicinity in shape and design. The approval of the queen (a set of this having been sent her) gave it the name of Queen's ware. When these were ornamented at all, it was with a simple band or a few delicate leaves in color. In 1768 Wedgewood began business for himself. In 1762 he secured a road to the pottery district, and later, water communication between the Mersey and Trent. The intercourse thus opened with the outer world helped the establishment and progress of Wedgewood's ornamental art greatly. He bought an estate between Burslem and Newcastle on the canal, named it Etruria, and established his vase potteries there.

Bentley, an extensive jobber of earthenware, of great business ability, became his partner in 1766. About this time he made a medallion likeness of Pitt, white upon a chocolate ground, — his first attempt at relief, — and followed it with countless copies of antique works, rilievo busts and cameos, together with original subjects designed by Flaxman, who worked for him thirteen years. Wedgewood's most noted work was the reproduction of the Portland vase, which he accomplished by casting a white opaque glaze over a deep blue ground, and then, with infinite labor, grinding it down to the ground with a diamond. A set of three hundred and sixty pieces, which he made for Catherine I of Russia, each piece painted with a separate view of English scenery, was one of his most important commissions. Perhaps the greatest of his inventions was the application of the brilliant glaze and bright enamel to hard pottery, which had previously been used only upon porcelain. This brought it within the means of the general public. He changed the tide of import to export. His wares, as catalogued by their producer, are : porphyry, black basalts or black Egyptian ware, jasper ware with white reliefs, porcelain biscuit fitted for chemical purposes, and table or queen's ware. Each of these wares at the time of their production was peculiar to Wedgewood.

Josiah Wedgewood was a man of taste, ambition, originality, ingenuity, and business ability. He selected eminent assistants, and was fortunate in the choice of his partner, who introduced him to the patronage and acquaintance of the great. His sons and grandsons have carried on the manufacture of Wedgewood ware in a manner worthy of its founder.

XXV.

HISTORICAL ORNAMENT.

IN the earliest times, when man made tools or weapons of stone or other material, he showed a natural love of ornament, and each epoch in man's history is characterized by an individuality of ornamentation. To this individuality the name of 'style' has been given, and to the ancient or historic styles we are to give our attention in this paper.

The savage tattoos his body in order to make himself terrible in the eyes of his enemies, or because he thinks it gives him a new beauty; he forms ornaments by weaving straw, bark, or pieces of wood, or carves his weapons or other articles into fantastic shapes. Occasionally, a mind stronger than those around it impresses itself on a generation, and carries with it a host of weaker minds, yet never so closely as to destroy the individual ambition to create: hence the creation of styles and their modification.

There are, of course, many varieties of nearly every style, but so long as the chief characteristics remain the same, it is the same; therefore styles are comparatively few. The whole number of the great characteristic developments or styles which have had any influence on European civilization are nine, and these nine may be divided into three groups,—the ancient, the mediæval, and the modern.

The ancient styles are the Egyptian, Greek, and Roman. The mediæval are the Byzantine, Saracenic, and Gothic. The modern are the Renaissance, Cinquecento, and Louis Quatorze.

These various styles extend over a period of upwards of four thousand five hundred years, of which two thousand may be considered as the ancient period, from the early historic times to the fourth century of our era; about one thousand years, from the fourth to the fourteenth century, may be classed as the mediæval; and the last five centuries, from the fourteenth to the nineteenth, comprise the period of the Renaissance, or modern period. Style is only another name for character. Every style is distinguished by its characteristics, and not by what it has in common with other styles.

An ornamental work does not belong to a style because it was executed in the period of that style, for a style is defined by its characteristics. The earliest style of ornament is the Egyptian, which was already established 1800 B. C. It is a hieroglyphic style in its sentiments and details.

The architecture of Egypt has this peculiarity over all other styles, — that the more ancient the monument, the more perfect the art. Most of the remains of Egyptian art with which we are acquainted, exhibit it in a state of decline. Monuments which were erected two thousand years before the Christian era are seen to have been made from still more ancient and more perfect buildings.

We are carried back to a time too remote to enable us to discover any trace of the origin of Egyptian architecture ; and while we can trace in direct succession the Greek, the Roman, Byzantine with its offshoots, the Arabian, the Moresque, and the Gothic, we must believe that of Egypt is a pure original style, which arose with civilization in central Africa, passed through countless ages to the culminating point of perfection, and fell into the state of decline in which we see it. In all other styles we can trace a rapid rise from infancy to perfection, followed by a lingering decline.

Egyptian ornament was not often chosen for effect's sake ; it generally has some meaning, being symbolical in character, though derived directly from nature, and conventionalized under the direction of the priests in such a manner as would best symbolize their religious beliefs. We cannot but admire the ingenuity of the Egyptian decorator who converted the almost incomprehensible hieroglyphics into tasteful and pleasing ornaments.

The zigzag, which was the type of water and symbolical of the overflowing of the Nile from which the greater part of Egypt derived its fertility, was an important detail of ornament, as was also the lotus, which had a similar signification.

The scarabæus or beetle and the winged globe as the symbols of immortality, are also important details ; they occur of all sizes and in almost all materials, and were used as talisman. The globe is supposed to represent the sun ; the wings Providence ; and the two asps, one on each side of the globe, dominion or monarchy, — thus uniting the creative, protective, and distributing powers. We almost invariably find this ornament placed over doors and windows, and in passages. It is sometimes of an enormous size, extending thirty feet or more. It also frequently adorns costumes and mummy-cases.

There are several other winged figures found in Egyptian friezes, natural and unnatural, as the vulture with the tau and ostrich feather, the hawk, the winged asp, and the human winged figure, corresponding apparently to those described in the works of the Jews.

The sphinx, a remarkable object in Egyptian art, does not come under the category of winged creatures ; in this it is distinguished from the Greek sphinx, which is always winged, and always female. The Egyptian sphinx is always male, and is supposed to represent the combination of physical and intellectual power.

It is also associated with the special forms and attributes of the great Egyptian deities. We find the man-sphinx, the ram-sphinx, the hawk-sphinx, or the lion's body with the head of the man, the ram, or the hawk, according to the deity symbolized. Sphinxes were generally placed either side of the paths leading to the temple.

The swelling asp is also a very characteristic ornament. We find friezes and borders composed of a series of asps, and it is very common to find them arranged also in symmetrical opposition, one on each side of the cartouche or shield enclosing the hieroglyphic name of a king, having the same signification of dominion, with a special reference to the king or dynasty expressed by the hieroglyphics in the cartouche.

The most essential characteristics of an Egyptian design, then, are these: the winged globe, the lotus, and the papyrus, the zigzag, the asp, and the cartouche containing hieroglyphics. These we find mixed up with many geometrical forms, as the fret, the spiral or wave-scroll, the star, etc.

The lotus and papyrus, growing on the banks of the river, symbolize food for the body and mind, and the feathers of rare birds, which were carried before the king, are emblems of sovereignty; the palm-branch, with the twisted cord made from its stems, are types used in decorating the temples of the gods, the palaces of kings, and as body coverings.

Egyptian ornament is of three kinds, — that which is constructive, that which is representative but at the same time conventionally rendered, and that which is simply decorative. To the first, namely, constructive ornament, belong the decorations of the means of support, and the crowning members of the walls. The column was an enlarged papyrus plant, the base representing the root, the shaft the stalk, and the capital the full-blown flower, surrounded by a number of smaller plants. Although the lotus and papyrus formed the types of most Egyptian capitals, yet they were ingeniously varied and arranged; while from Greek days to our own time the world has been content with acanthus leaves arranged around a bell for the capitals of columns, with little variation of plan.

The shaft of the Egyptian column, when circular, was made to retain the triangular shape of the papyrus by raised lines which divided its circumference into three equal portions; when the column was formed by four or eight shafts bound together, these had each a sharp edge on their outer face for the same reason.

The crowning member or cornice of an Egyptian building was decorated with feathers, which appear to have been emblems of sovereignty, whilst the winged globe in the centre is an emblem of divinity.

The second kind of Egyptian ornament results from the conventional representation of actual things on the walls of temples and tombs; and here again, in the representation of offerings to the gods, or of various articles of daily use, in the paintings of actual scenes of their domestic life, every flower or other object is portrayed, not as a reality, but as an ideal representation. We find that the Egyptians obeyed the laws of radiation of the leaves and veins on the leaves in graceful curves from the parent stem; and that they not only followed this rule in drawing the individual flower, but in the grouping of several flowers together.

The third kind of Egyptian ornament, which is simply decorative, is used on tombs, dresses, utensils, and sarcophagi.

Rope ornament was subject to a geometrical arrangement, but the unrolling

of the cord gives the very form which is the source of so much beauty in many subsequent styles.

As we proceed with other styles, we shall see that they approached perfection only so far as they followed Egyptian principles.

The firmness, justness, and fulness of Egyptian drawing has never been surpassed; the lines of hieroglyphics covering the papyrus, and executed in running hand, surpass sometimes even the finest works of the Greeks. The Egyptians used color as they did form, conventionally: the colors used were principally red, blue, yellow, with black and white to define and give distinctiveness to the rest; green was generally used, though not universally, as a local color, as upon the green leaves of the lotus; these were, however, indifferently colored green or blue, — blue in more ancient times and green during the Ptolemaic period, at which time, also, both purple and brown were added, but with diminished effect.

In Egypt we find grandeur of proportion, simplicity of parts, and splendor or costliness of material to be the great art-characteristics, as they are the prevailing characteristics of Asiatic art.

Assyrian and Persian styles. — Those best versed in Assyrian art, are inclined to believe that it was not an original style, but was borrowed from the Egyptians, modified by the difference of the religion and habits of the Assyrian people.

Greek style. — Greek art, though borrowed partly from the Egyptian and partly from the Assyrian, was the development of an old idea in a new direction: symmetry and regularity are its general principles. The Greeks carried pure form to a point of perfection which has never since been reached; their art was wanting, however, in one of the great charms which should always accompany ornament, namely, symbolism. It was purely decorative, never representative, and can hardly be said to be constructive, for the various members of a Greek monument rather present surfaces exquisitely designed to receive ornament: the ornament could be removed, and the structure would remain the same.

The Doric Age. — The first historic age of Greek art, from the first historic records, comprises altogether a period of about four centuries.

The style of this period prevailed from the western shores of Asia to the extreme limits of Sicily, and is illustrated by the many interesting Doric ruins still preserved. The most important manufacture of the period, of which remains exist, was that of terra-cotta vases; and on these we find all the characteristic ornaments of a distinctively Greek style of decoration. These vases show exactly the same ornaments, though necessarily modified in their treatment, as those which are found in the architectural ornaments of the time. The examples of representative ornaments suited to architecture are the zigzag, the wave scroll, the labyrinth or Greek fret, cable mouldings, astragals, ogees, channellings, egg mouldings, and ornaments designed from the ox's skull called bucranes.

There is but little doubt that we are acquainted with Greek art in all its phases, as the painted ornament on the Greek and Etruscan vases does not differ from that found on any temples which we know. Like the Egyptian,

the types are few, but the conventional rendering is much farther removed from these types.

A very characteristic feature of Greek ornament, continued by the Romans but abandoned during the Byzantine period, is that the various parts of a scroll grow out of each other in a continuous line, as may be seen in the ornament from the Choragic monument of Lysicrates. In the Byzantine, Arabian, Moresque, and early English styles, the flowers branch off on either side from a continuous line.

We have here an instance of how slight a change is sufficient to generate an entirely new order of forms and ideas. Roman ornament was constantly struggling against an apparently fixed law; and scarcely ever got beyond the arrangement of a volute springing from a stem fitted into another stem, and encircling a flower.

It is almost universally recognized that the white marble temples of the Greeks were entirely covered with painted ornament, the coloring as well as the form being always conventional.

As the hot, rainless climate of Egypt made massive flat roofs necessary, so the rainy seasons of Greece rendered sloping roofs desirable, and from their gables the Greeks eventually developed their beautiful pediment. The pediment necessitated the frieze — æsthetically more than mechanically — to diminish its apparent weight to balance the parts, and to strengthen the entablature. The only Greek example of a temple without a pediment — the Pandroseion at Athens — has no frieze in its entablature.

The distinctive ornament of the three Greek architectural orders, as they are termed, is the capital. The Doric capital consists of a round, flat cushion, called the echinus, and a large square abacus, the lower diameter of the echinus being that of the pillar, its upper that of the abacus. The cushion is called the echinus from its being invariably decorated with that ornament. The Doric order might well be called the echinus order; and the echinus is accordingly the principal ornament of the period. Like the Egyptian, the Greek is distinguished for its broad, flat surfaces; even its curves are flat, of a parabolic character. The Ionic or voluted capital was used in Asia Minor as early as the middle of the sixth century before our era. The acanthus was very little used by the Greeks, while with the Romans it was a favorite.

Roman ornament, the last of the ancient styles, is simply an exaggeration of the florid Greek. The Romans did not add a single important element to Greek ornament; they were original only in their treatment of Greek material. Roman art is accordingly Greek art, and it is probable that nearly all the great artists employed by the Romans were Greeks. The real greatness of the Romans is rather to be seen in their palaces, baths, theatres, aqueducts, and other works of public utility, than in their temple architecture, which, being the expression of a religion borrowed from the Greeks, and in which they probably had little faith, exhibits a corresponding want of earnestness and feeling for art.

In the Greek temple it is everywhere apparent that the struggle was to arrive at a perfection worthy of the gods. In the Roman temple the aim

was self-glorification ; from the base of the column to the apex of the pediment, every part is overloaded with ornament, tending rather to dazzle by quantity than to excite admiration by the quality of the work. Greek temples, when painted, were as much ornamented as those of the Romans, but with a very different result. The ornament was arranged so that it threw a colored bloom over the whole structure, and in no way disturbed the exquisitely designed surfaces which received it. The Romans did not value the general proportions of the structure, nor the contours of the moulded surfaces, for they entirely destroyed them by the elaborate surface-modelling of the carved ornaments. These ornaments do not grow naturally from the surface, but are applied to it.

The fatal facilities which the Roman system of decoration gives for manufacturing ornament by applying acanthus leaves in any form and in any direction, is the chief cause of the invasion of this ornament into most modern work ; for it requires so little thought, and is so completely a manufacture, that it encourages architects to neglect one of their special provinces, and the interior decorations of buildings have thus fallen into hands most unfitted for their work.

The only distinct Roman order is the composite ; it comprises, as its name implies, all the three Greek orders, — the echinus, the voluted, and the acanthus orders. The arch is a Roman feature. Where the Greeks used the horizontal entablature, the Romans often employed the arch. The Romans used the mallis, or soft acanthus ; the Greeks used the prickly acanthus : but the Roman ornament for capitals is commonly composed of conventional clusters of olive-leaves, — a modification arising out of the necessity for strong effect, in massive, lofty temples, — but this leaf does not occur otherwise than on the capitals. In the use of the acanthus-leaf the Romans showed but little art ; they received it from the Greeks beautifully conventionalized ; they adhered more closely to the general outline, but exaggerated the surface decoration. Roman buildings are uniformly more massive than Greek, as well as bolder in their details ; their curves are fuller, those of the Romans being circular, and those of the Greeks elliptical. The free introduction of monsters and animals, such as the sphinx, the triton, and the griffin, is likewise characteristic of Greek and Roman ornament ; they occur, however, much more abundantly in the Roman. Roman ornament consists universally of a scroll growing out of another scroll, encircling a flower or group of leaves. In Greek ornament the scrolls grow out of each other in the same way, but are much more attenuated at the point of junction.

The three ancient styles — Egyptian, Greek, and Roman — are very distinct. The Egyptian is symbolic, rich, and severe at the same time ; the Greek is severe and beautiful ; and the Roman rich and beautiful, at least in its best examples. Greek taste steadily progressed until about the time of Alexander ; from this period, richness and abundance of ornament gradually supplanted the chaster principles of design.

The Greeks were always lovers of splendor. This splendor was carried out by the Romans on a still greater scale, until their boundless luxury induced an indiscriminate and extravagant use of ornamental detail.

XXVI.

HISTORICAL ORNAMENT.—MIDDLE AGE STYLES.

WHAT may be technically termed ancient ornament ends with the Roman. The change of religion which ensued through the adoption of Christianity by Constantine totally revolutionized ornamental as well as all other art. Indeed, we find that the delay in, as well as the flourishing growth of the arts and sciences, has ever been dependent on those two mighty sources of all movement in the moral world,—religion and the form of government. Sometimes one, sometimes the other determines the result; but generally speaking, the influence of both causes has operated so uninterruptedly from the very birth of the arts down to our times, that their history is almost inseparably connected with the history of religious opinion and of political revolutions. Accordingly, the mighty revolution which accompanied the downfall of the Roman Empire, and the introduction of an entirely new religion, could not fail to exercise an influence upon art and its forms; and all the more, as even under the first emperors, a decline of correct taste had become perceptible.

Before we proceed to study the art which was the child of the new religion, we must pause a moment to mourn over the ruin of the old, caused by the destructive zeal of the Christians. Not content with demolishing statues, paintings, and mosaics of mythological import, they attacked other objects of art; everything pagan was for the most part destroyed. When materials were needed for building new churches and basilicas, heathen temples, and even profane edifices, were pulled down to furnish them. While the Christians were burying the most beautiful statues in fragments under the floors of churches in order that they might, as it were, tread them under foot, the adherents of the old faith buried all they could save, in order to preserve them from destruction. This accounts for statues being found where no temple or altar ever stood.

The fifth century was the most fatal to the remains of ancient art and civilization; for then the barbarian hordes invaded and laid waste the Roman provinces. During that single century Rome was five times invaded and once set on fire. It is hardly necessary to say that in such times artists created nothing new. Especial pains were taken to adorn the graves in the catacombs, and we must betake ourselves to them if we wish to behold the remains of art of that period.

The palm branch, so frequent upon grave slabs, was formerly thought to mark the tombs of the martyrs, but is now known to have been simply the emblem of the victory of Christian faith, a discovery which greatly reduces the number of martyrs supposed to have been buried in the catacombs. The emblems upon these tombs are very curious as showing the transition from Pagan to Christian art. The sarcophagus of the sister of the Emperor Constantine is covered almost entirely with pagan bas-reliefs ; upon one end of another sarcophagus there is a representation of the heathen god Mercury carrying a goat upon his shoulders, and upon the other end one of the Good Shepherd bearing the sheep. Another curious representation is of the Good Shepherd with the Pandean pipes, bearing the goat on his shoulders while the sheep stand beside him. The cross did not appear in art until fully a century after its abolition as a means of punishment. All the scenes connected with the crucifixion, so common in later art, are wholly unknown to that of the catacombs. Christ was to those early Christians the Good Shepherd, and not the Sacrificial Lamb.

Although in these works we here and there see traces of the better periods of art, the majority of them are weak in invention, coarse in execution, and generally faulty in drawing. Paltry, and destitute of all artistic value as are the works of these times, contemporary writers are lavish in the praises they bestow upon them ; nor is this to be wondered at ; for in a time of universal ignorance, when an acquaintance with the art of writing was a rare accomplishment, the production of a painting or a piece of sculpture, however poor in quality, seemed a glorious performance ; and this all the more as in the East, during the first centuries of Christianity, the making of sacred images and sculptures was strictly prohibited by the teachings of the church. In the fifth century a religious council decreed that in future Christ in the human form, and not the lamb, should be depicted on the cross. The use of crucifixes in painting and sculpture commences from that time, and in the earliest one Christ always appears clothed, with a royal crown on his head, and fastened with four nails to the cross. The use of three nails did not arise till later. Shortly after, a systematic attack upon images was begun by the Iconoclasts, which set the Eastern and Western churches at variance, and led to an utter destruction of sacred monuments throughout the East ; repeated edicts were issued against the adoration of images ; holy figures in pictures still extant, were caused to be painted over with birds, flowers, and ornamental foliage in the Arabian taste, while those artists who engaged in the representation of sacred subjects were threatened with severe punishments, and even thrown into prison. But before one hundred years had passed, the use of sacred images was revived, and spread so rapidly that each military cohort carried with it the image of its saint in a small chapel mounted on two wheels.

Art, thus subjected to hieratic caprice, could make but little progress. In the tenth century came the dawn of a revival, which was not fully realized, however, until the thirteenth century. The wealth which the cities of Italy acquired through commerce, and increased by means of the Crusades, fostered in the citizens a love of splendor, and consequently a taste for art,

which led them to vie with each other in the munificence with which they adorned their palaces and churches with marbles, works of sculpture, paintings, and mosaics. Notwithstanding the degraded condition of the arts, the fondness for beauty and embellishment which is inherent in man, extended the practice of art over every part of Europe; and we perceive its feeble beginnings in those buildings of the period which have survived to our time.

Christian art was at first very much under the influence of Roman art, which had already declined considerably; this was especially the case in the western part of the empire, Italy, Germany, France, etc., where it was termed Latin or Romanesque. The other branch of Roman art, known as the modern Greek or Byzantine, originated in Constantinople from the more Oriental development of the Roman style occasioned by the conquest of a part of Asia by the Romans, who found in the East fresh elements to satisfy their sumptuous tastes. During the first and second centuries Christian works of art were limited to symbols, never decorations, but as exhortations to faith and piety. All Christian decoration rests upon this foundation, the same spirit of symbolism prevailing throughout until the return to the heathen principle of beauty, in the period of the Renaissance. The early symbols were the monogram of Christ, variously written, the lily, the cross, the serpent, the aureole or vesica piscis, — an acrostic symbol, the fish, from the common Greek word for fish, — the initials of the following sentence, Jesus Christ, of God, the Son, the Saviour, — and the circle or nimbus, the glory around the head, as the vesica is around the entire body. These are all very important elements in Christian decoration, especially the nimbus, which is the element of the trefoil and quatrefoil and analogous forms, so common in Byzantine and Gothic art, — the trefoil having reference to the Trinity, and the quatrefoil to the four evangelists as the witnesses to Christ, as well as to the cross, at the extremities of which we often find the circle together with the circle or nimbus in the centre signifying the Lord. The circles at the extremities which are the nimbi of the evangelists, often contain their respective symbolic images, the angel, the lion, the ox, and the eagle, thus making their signification palpable. Why the beautiful and accomplished styles of the ancients were discarded for such comparatively crude elements of ornament, needs no other explanation than that they were pagan. Paganism consisted, however, solely in forms, not in colors; and therefore as regarded colors, there were no restrictions. Ancient forms also, as paganism itself gradually disappeared, were slowly admitted among the elements of Christian decoration; and the scroll, under certain modifications, became eventually a very prominent figure in Byzantine ornaments. Under a similar modification the anthemion and every other ancient form of ornament was gradually adopted, after a systematic exclusion of four or five centuries. All Byzantine decorations, however, are strictly conventional, a trefoil leaf or a lily form being the ordinary foliation for a scroll; and every form, whether derived from nature or from earlier styles of art, being always treated in a peculiar manner. More skill on the whole was displayed in the general effects than in the details, and owing to the richness of material used, which was characteristic of Byzantine

taste, a heavy, gorgeous style was ultimately developed out of a rude symbolism. The leading forms of Byzantine and Romanesque architecture are likewise due to the same influences, the cross, the circle, and the dove being everywhere met with. The details of Byzantine buildings are in a great measure borrowed from ancient Greek architecture. We have been tempted in the study of the mediæval styles to overstep the bounds of simple ornament, as we find such marked characteristics in mediæval architecture. Thus the basilicas contain numerous columns of marble, Greek or Roman capitals, architraves and cornices, which speak of the Athenian or Ephesian sculptor. But when available fragments became scarce, the Byzantine artists were compelled to originate works in accordance with the massive forms of their basilicas. They thus produced their own heavy capital, which resembles the Corinthian divested of its foliated ornaments, and with its cup pressed into quadrangular shape. This nearly cubical mass received only a few foliated ornaments in relief, or fantastic figures in place of foliated work, which latter were much imitated in Italy, on the Rhine, in Normandy, and in England, where they were frequently employed in the eleventh century. The decorations on the Corinthian entablature and cornice underwent similar changes, the moulding being replaced by a few inclined planes, embellished with sculptures, paintings, or mosaic. Sculptured Byzantine ornamental work is broad and heavy, frequently exhibiting strings of pearls, and festoons apparently set with precious stones. The foliated work is very boldly profiled, the leaves generally terminating in points.

Eastern churches were generally of a square, round, or polygonal form. The characteristic difference between the Byzantine and the Romanesque styles, is that the former always had a cupola, whilst the latter, even in buildings whose form was round, had flat roofs of carpentry. Byzantine façades were often ornamented in freestone and brick, used together, the latter laid both in horizontal and in vertical lines, so as to form frames around panels of freestone. Great variety of decoration is attained in this manner, enhanced by the application of moulded, carved, and Y-shaped bricks. Another peculiarity of this style is that the slope of the roof seldom appears in view: the top of the building is generally a straight line surmounted by a cupola placed over the central rotunda, and sometimes by smaller domes at the sides, which in large buildings mark the points of connection between the vestibule and the side-aisles.

The eleventh century was the period of the introduction of towers in the construction of churches. The cathedral at Trani has probably the oldest known tower; it is very simple, and like the towers of that time generally, is not so high as those of the subsequent German style. This cathedral may be regarded as the connecting link between the Byzantine and Gothic styles, as it exhibits both round and pointed arches. The Byzantine was so widely spread, and so thoroughly identified with all mediæval art after the first few centuries of the Christian era, that its influence even in Italy did not wholly decline before the fifteenth century. Both the Saracenic and the Gothic proceeded from the Byzantine; the Greek missionaries carried its influence into

the extreme north ; and while the artists of Syria were accommodating their style to Mohammedan exclusiveness in the south, the mysteries of Mount Athos were freely mixed up with the fables of Scandinavian mythology in the colder regions of Europe. The Scandinavian soldiers, also, of the imperial body-guard at Constantinople, made, on their return, the talismans of Christian mythology almost as familiar in their native homes as the gods of their forefathers. The cross planted on the serpent is not an uncommon image on Mount Athos ; and the cross surmounted by the so-called Runic knot is only a Scandinavian version of the original Byzantine symbol of the redemption, — the crushed snake curling round the stem of the avenging cross.

The buildings, for the most part ecclesiastical, erected by the Lombards in Italy in the seventh and eighth centuries, are in their main features Byzantine ; but for several peculiarities they have been grouped by themselves, and constitute the monuments of the Lombardic style. Their main characteristics are, 1. Very small windows with semicircular arch. 2. Half or three fourths columns placed at the entrance, and grouped so as to form perspective gateways. The columns of the two sides are connected above by semicircular arches ; their bases, shafts, and capitals are decorated with rude, foliated work, or symbolic figures, while their Byzantine capitals in a measure approach the Corinthian. The columns of the interior supporting the arches generally have rude cubic capitals. 3. The rude sculptures frequently satirize the vices of the priesthood. 4. Festoons, wrought in stone, appear under the main cornices. 5. The spires on the towers are invariably pyramidal.

The Saracenic, or Moorish, as the development of the same style was called in Spain, proceeded from the Byzantine, but was greatly modified by the stringent Mohammedan law, which forbade any imitation of living things, vegetable or animal, in decoration. Such conditions led, of course, to a very individual style of decoration, for vegetable forms were now excluded from ornament for the first time. By the eighth century, however, to which the rich works of the Saracens belong, the Byzantine Greeks who were pressed into the service of the Arabian caliphs and generals, were already sufficiently skilful to make light of such exclusions, and the exertion of ingenuity to which they were compelled gave rise, perhaps, to a more beautiful simply ornamental style than any that had preceded it, as there was no longer any division of the artistic mind between meaning and effect. Symbolic figures, which had hitherto engrossed so much of the artist's attention, were now excluded, but the mere conventional ornamental symbolism, and the ordinary forms borrowed from the classic period and geometry, left the artist an abundant field, which was further enriched by the peculiarly Saracenic custom of making inscriptive designs. The curves or angles or interlacings of the characters were now made to bear the chief burden of a design ; the curves, however, very naturally fell into the standard forms and floral shapes, and the lines and angles were soon developed into a very characteristic species of tracery or interlaced strap-work, very agreeably diversified by the ornamental use of inscriptions. The Saracenic was the period of gorgeous

diapers ; but like the Byzantine it was more remarkable for its general effects, than for any peculiar merit of detail or combinations of details. The designs are made up of an infinite number of minute contrasts of light and shade and color, something like a formal flower-garden, but wanting in the grandeur and simplicity of natural scenery. No other details are so applicable for mere fillings as the Saracenic, and hence we find them constantly recurring in Renaissance designs.

Among the prominent features in Saracenic architecture are, 1. The horse-shoe-shaped arches, which generally occur alone, but sometimes in connection with semicircular arches, and even surmounted by them in a few buildings. The latter arrangement is of exquisite effect, being exceedingly picturesque, and it is remarkable that it has never been imitated in other styles of building. 2. The Moorish columns, employed in great numbers, are remarkably slender. Their capitals are sometimes antique, but generally of a peculiar shape, best described as that of two truncated pyramids placed base to base, the upper one being inverted like an hour-glass. 3. The walls and niches are richly inlaid with peculiar ornaments and sentences from the Koran, sometimes in stucco, and frequently even in precious stones. The ornaments are painted with gaudy colors, chiefly purple, azure, and gold. 4. The floors are of colored marble, laid in elaborate patterns. 5. The vaults and arches frequently exhibit lattice-work, through which the buildings are lighted. 6. The entablature, consisting of but few members, always projects boldly. 7. The height of the buildings is generally limited, though they cover extensive areas. 8. The cupolas, which frequently occur, are mostly bulbiform.

As the Norman style was originally developed in Sicily, it contains many Saracenic features, of which the pointed arch and the zigzag are the most characteristic. The original Norman was not national, but simply Romanesque or Byzantine.

The last great middle-age style, the Gothic, grew out of the Byzantine, like the Saracenic ; it flourished chiefly on the Rhine, in the north of France, and in England. Authorities differ as to the name this style should receive. Goethe proposed that it should be called German, for it originated in Germany, and has but few characteristics in common with the older styles, least of all with the real Gothic style, the name given to that which originated in Italy during the supremacy of the Goths in that country under Theodoric. Only a limited number of these buildings have been preserved : they all show that this style equally approaches the ancient Roman and the Romanesque ; exclusive application is made of the semicircular arch and semicylindrical vault. But setting aside this distinction, we will agree, with Wornum, to give the name of "Gothic" to the pointed-arch style, the oldest monuments of which date from the tenth century, and are found in Germany ; it was more generally developed in the thirteenth century, was perfected in the fourteenth, and in the sixteenth became extinct. In its general forms, the Gothic is essentially a pointed and geometrical style, though all the symbolic elements of the Byzantine are preserved in it ; its details appear to

be an infinite repetition of the greater architectural features by which it is distinguished, as the spire in place of the dome, and the pointed in the place of the round arch. It has the pointed arch, however, in common with the Saracenic. As an ornamental style it is an excessive elaboration of the pointed and geometric element, vertical and diagonal lines prevailing over the others. It is further peculiar in its combinations of details: at first the conventional and symbolic prevail, and afterwards these are combined with the elaboration of natural objects proper to its localities. We find Gothic examples not only the traditional conventional types, but also, in the later periods, exact imitations of the plants and flowers growing in the neighborhood mixed with them. This is a great feature, but still always secondary to the elaboration of geometrical tracery, — vesicas, trefoils, quatrefoils, etc. with many other geometrical combinations, — which always remains the main characteristic of the style, whether the so-called early English, the decorated or the perpendicular, French or German. In ornament, therefore, as in architecture, it is the geometrical tracery which stamps a design with a Gothic character; mixed with natural flowers only, it is still Gothic; but the example is more characteristic when it contains also the historic ornaments of the style, as the Tudor flower, the fleur-de-lis, the crocket, trefoil, vine, scroll, and other familiar details. The Gothic scroll always preserves the character of its early Byzantine type, namely, that of a foliated serpentine rather than a succession of spirals. Gothic capitals are of the most varied forms; their decorations are either sculptured or painted, or both. Smooth capitals are mostly painted; there are even instances on record where very excellent sculpture in capitals was filled up with mortar and smoothed over in order to make a surface for painted ornament. Not unfrequently most exquisite sculptural work has been discovered in capitals that were thus plastered up. The sculptures of this period either represent human figures or subjects from the animal and vegetable kingdoms, or various human pursuits. Entire historical representations are also sometimes met with on capitals, or clerical processions or symbolic groups, whose import it is frequently difficult to interpret.

The improvement of windows in the pointed style was gradual: at first they were small and simple; then coupled; next coupled with a perforated foil rosette between their heads; the desire for greater ornament with the windows became more and more complicated, and designing patterns for windows became a special art, — the art of tracery. One centre mullion not being found sufficient to admit of many variations of design, three, five, and even seven were introduced. Rosette windows occur as late as the fifteenth century; but their strictly circular form was gradually abandoned for convex-sided triangles or polygons with strictly geometrical divisions. Such windows of the purest taste are very numerous in Germany.

The characteristic of the pointed-arch Gothic church is the bell-tower or spire. Its lower portion is usually a square building, or tower proper, which at a certain height passes into a circular or polygonal form, and then tapers to a point to form a spire or steeple. The bells are usually hung in

the upper part of the tower, below the pyramidion, and their position is marked on the exterior by the belfry window or other aperture for the escape of the sound.

In the fifteenth century, the tasteful distribution of ornaments over the entire building was discontinued to make room for a meretricious decoration of single parts. Ornaments ceased to be purely constructive, and therefore true. Hence it is that from this time we begin to trace a decline.

XXVII.

HISTORICAL ORNAMENT.

(Continued.)

THE history of Byzantine ornament begins when Constantine established his new seat of government on the shores of the Bosphorus, A. D. 330. Byzantine is derived from Byzantium, the ancient name of Constantinople.

In the new capital, churches, palaces, and private dwellings, triumphal arches and public baths, rapidly arose in great number and magnificence; and the Rome of the East, under the auspices of the renowned emperor, soon rivalled the past splendors of that other imperial city, now fast falling into ruin on the banks of the Tiber.

To get an idea of pure Byzantine ornament, the attention of the investigator must first be turned to the wonderful Mosque of St. Sophia at Constantinople, rebuilt by Justinian on the site of a church which had been built and burned during the reign of Constantine.

The Cathedral of St. Sophia was erected 500 years after the birth of Christ, under the supervision of Justinian and two famous architects, Isidorus of Miletus and Anthemius of Tralles. To enrich it, Palmyra, Ephesus, and Pegamus were despoiled, and very many cities of renown utterly stripped of their art treasures. The two architects had a hundred master-builders under them, and each one of these hundred workmen, who were paid stone by stone, extra pay for extra work. The expense of the structure was so enormous, that all the wealth Justinian could apply to it, and all the free gifts that flowed in upon him for it, were not sufficient without increased taxation, tributes from the provinces, and spoils from conquered nations, all of which were required to fill the public treasury with the means to finish it.

Byzantine art reached its climax with the completion of St. Sophia, and when Justinian made his famous declaration, "Solomon, I have outdone thee!" the whole civilized world about him believed it. In fact, the edifice is regarded to this day, by many eminent architects, as the greatest marvel of building construction in existence.

Before the transfer of the Roman Empire to Byzantium all the arts there were either in a state of decline or process of transformation, and Constantine soon found himself under the necessity of employing artists and workmen of

many schools. Thus it is that the peculiar characteristics of Byzantine ornament are outgrowths of other styles.

Much of the decoration known as Byzantine is easily traced to the temples and churches of Asia Minor. Constantine continually employed the artists of Rome, Syria, and Persia in the decoration of his Eastern capital, and there speedily wrought a change in the traditional Roman styles of ornament.

The symbolism of the early Christians was largely adopted by the workmen under Constantine. Thus the cross, emblem of eternal life among all the nations of the earth, became the favorite and most prominent symbol. Very many of the emblems used by pagan nations were appropriated after a change of meaning had been given to them. That which would have been deemed offensive, in one sense, became revered and welcomed through a different interpretation. The Bacchanalian subjects of the ancients became typical of the vineyard of faith, sometimes of the Last Supper; and the ear of corn, standing for the favor of the gods among the pagans, became the symbol of plenty in Byzantine decoration. The palm-branch, indicative of pagan victories, typified Christian triumphs in the church. The dove of Venus became the Holy Spirit; Isis, mother of the Egyptian Horus, "Our Blessed Lady"; and the stag of Diana, the soul thirsting for living waters. The eagle and the lion, attributes of the Roman gods, became symbols, of the two evangelists, St. Jerome and St. John, while the phoenix, the pelican, the crown, the fish, the griffin, the lamb, the peacock, the anchor, the monogram, the lyre, the standard, and many other pagan emblems, became Christian under the Christian decorators.

The great division of the Christians into two opposite and hostile parties, the Greek Church and the Latin Church, was mainly brought about by the refusal of the Bishop of Rome to obey the orders of the Patriarch of Constantinople in regard to the destruction of all pagan sculptures and pictures not adopted by the Eastern Church.

Turkish Ornament. — Although the Turks and the Arabians have the same religion, yet, being of different national origin, their art representations are, as might be expected, somewhat different. The architecture of the Turks, as seen at Constantinople, is mainly based upon that of the early Byzantine monuments, with the exception of their modern edifices, which are designed in the most European style. Their system of ornamentation is of a mixed character, — Arabian and Persian floral ornaments being found side by side with debased Roman and Renaissance details. The art instinct of the Turks is quite inferior to that of the East Indians. The only good examples we have of Turkish ornamentation is to be seen in Turkey carpets, and these are chiefly executed in Asia Minor and most probably not by the Turks. The designs are thoroughly Arabic.

Moresque or Moorish Ornament. — The ornamental art of the Moors, who established the seat of their power in Spain during the eighth century, furnishes us with another illustration of the results produced by corresponding influences of religious faith, and diversities of national character. The main differences between the Arabian and Moorish edifices consist in that the former are rather

distinguished for their grandeur, the latter for their refinement and elegance. In ornamentation the Moors were unsurpassed, and in it they carried out the principles of true art even more than the Greeks.

Arabian and Moorish art were alike wanting in symbolism, but the Moors compensated for this want by the beauty of their ornamental written inscriptions and the nobleness of the sentiments expressed by them. To the artist these inscriptions furnished the most exquisite lessons in art; to the people they proclaimed the might, majesty, and good deeds of the king; and to the king they never ceased to declare that there was none powerful but God, that He alone was conqueror, and that to Him alone was ever due praise and glory. A law of the Mohammedan religion forbade the representation of animals or of the human figure.

In the best specimens of Moorish architecture decoration always arises naturally from construction; and although every part of the surface may be decorated, there is never a useless or a superfluous ornament. All lines grow out of one another in natural undulations, and every ornament can be traced to its branch or root. There is no such thing as an ornament jotted down merely to fill a space, without any other reason for its existence.

The best Moorish ornamentation is found in the Alhambra, a celebrated palace of the Moorish kings, at Granada, in Spain. This immense and justly famous structure, of rather forbidding exterior, but gorgeous within almost beyond description, was erected in the thirteenth century, and much of it remains perfect to the present day. It has been said by a competent judge that "every principle which we can derive from the study of the ornamental art of any other people is not only ever present here, but was more universally and truly obeyed by the Moors than by any other people." And further, that "we find in the Alhambra, the speaking art of the Egyptians, the natural grace and refinement of the Greeks, and the geometrical combinations of the Romans, the Byzantines, and the Arabs." The walls of the Alhambra were covered with a profusion of ornamentation, which had the appearance of a congeries of paintings, incrustations, mosaics, gilding, and foliage, and nothing could be more splendid and brilliant than the effects that resulted from their combinations. The mode of piercing the domes for light, by means of star-like openings, produced an almost magical effect.

Persian Ornament. — The Mohammedan architecture of Persia, and Persian ornamentation, are alike mixed in style, and are far inferior to the Arabian as exhibited in the buildings at Cairo. The Persians, unlike the Arabs and the Moors, mixed up the forms of natural flowers and animal life with conventional ornament.

East Indian Ornament. — Numerous manufactures calculated to give a high idea of the ingenuity and taste of the people of British India, were shown at the Great Exhibition of the Industry of All Nations, in London, in 1851. Among these were various articles in agate from Bombay, mirrors from Lahore, marble chairs from Ajmeer, embroidered shawls, scarfs, etc., from Cashmere, carpets from Bangalore, and a variety of articles in iron inlaid with silver. In the application of art to manufactures the East Indians exhibit great unity

of design, skill, and judgment, combined with great elegance and refinement in execution. In these respects they seem far to surpass the Europeans, who, says Mr. Owen Jones, "in a fruitless struggle after novelty, irrespective of fitness, base their designs upon a system of copying and misapplying the received forms of beauty of every by-gone style of art." All the laws of the distribution of form which are observed in the Arabian and Moresque ornaments are equally to be found in the productions of India, while the coloring of the latter is said to be so perfectly harmonized that it is impossible to find a discord. This, of course, refers to the selected articles placed on exhibition in 1851.

Hindoo Ornament. — We have but little reliable information about the ancient or Hindoo architecture of India ; yet we know this much, — that the Hindoos had definite rules of architectural proportion and symmetry. One of their ancient precepts, quoted by a modern writer, says, "Woe to them who dwell in a house not built according to the proportions of symmetry ! In building an edifice, therefore, let all its parts, from the basement to the roof, be duly considered."

The architectural features of Hindoo buildings consist chiefly of mouldings heaped up one over the other. There is very little marked character in their ornaments, which are never elaborately profuse, and which show both an Egyptian and a Grecian influence.

Chinese Ornament. — Notwithstanding the great antiquity of Chinese civilization, and the perfection reached in their manufacturing processes, ages before our time, the Chinese do not appear to have made much advance in the fine arts. They show very little appreciation of pure form, beyond geometrical patterns ; but they possess the happy instinct of harmonizing colors. Their decoration is of a very primitive kind. The Chinese are totally unimaginative, and their ornamentation is a very faithful expression of the natural characteristic of this peculiar people, — oddness.

Celtic Ornament. — The Celts, the early inhabitants of the British Isles, had a style of ornamentation peculiarly their own, and singularly at variance with anything to be found in any other part of the world. Celtic ornament was doubtless of independent origin, but it everywhere bears the impress received by the early introduction of Christianity into the islands.

The chief peculiarities of Celtic ornament consist, first, in the entire absence of foliage or other vegetable ornament ; and secondly, in the extreme intricacy and excessive minuteness and elaboration of the various patterns, mostly geometrical, consisting of interlaced ribbon-work ; diagonal, straight, or spiral lines ; and strange, monstrous animals or birds, with their tail-feathers, top-knots, and tongues prolonged into long interlacing ribbons, which are intertwined in almost endless forms, and in the most fantastic manner. Celtic manuscripts of the Gospels were often ornamented with a great profusion of these intricate designs.

What is called Celtic ornamentation was practised throughout Great Britain and Ireland, from the fourth or fifth to the tenth or eleventh centuries. There was a later Anglo-Saxon ornamentation, equally elaborate, employed in the decoration of manuscripts of the Gospels and other holy writings ; but

here leaves, stems, birds, etc., were introduced, and interwoven with gold bars, circles, squares, lozenges, quatrefoils, etc.

Mediæval or Gothic Ornament.—The high-pitched gable and the pointed arch, with towers, columns, and capitals, of consequently slender proportions, are the leading characteristics of mediæval or Gothic architecture, which came into general use in Europe in the thirteenth century. Mediæval Gothic art, like the Egyptian, was symbolic, deriving its types from the prevailing religious ideas of the period. Thus the churches and the cathedrals of the Middle Ages were built in the form of a cross,—the sign and symbol of the Christian faith. The numbers three, five, and seven, denoting the Trinity, the five traditional wounds of the Saviour, and the seven Sacraments, were preserved as emblematical in the nave and two aisles, in the trefoiled arches and windows, in the foils of the tracery, and in the seven leaflets of the sculptured foliage; while the narrow-pointed arches and the numerous finger-like pinnacles rising above the gloom of the dimly-lighted place of worship, symbolized the faith which pointed upward from the trials of earth to the happy homes of the redeemed. The transition from the Romanesque (later Roman) or rounded style to the pointed, is easily traced in numerous buildings where the two styles are intermingled; but the passage from Romanesque ornament to Gothic is not so clear. In the latter, new combinations of ornaments and tracery suddenly arise. The piercings for windows become clustered in groups, soon to be moulded into a network of enveloping tracery; the acanthus leaf disappears; in the capitals of columns of pure Gothic style, the ornament springs directly from the shaft, which, above the necking, is split into a series of stems, each terminating in a conventional flower, the whole being quite analogous to the Egyptian mode of decorating the capital.

In the interior of the early Gothic buildings, every moulding had that color best adapted to develop its form; and from the floor to the roof there was not an inch of space without its appropriate ornament, the whole producing an effect grand almost beyond description. But so suddenly did this profuse style of ornament attain its perfection, that it almost immediately began to decline. What is called “ornamental illumination,” that is, the decoration of writing by means of colors, and especially the decoration of the initial letters in pages of manuscript, attained a high degree of perfection under the Gothic influence.

Renaissance Ornament.—The fact that the soil of Italy was so covered with the remains of Roman greatness that it was impossible for the Italians to forget them, however they might neglect the lessons they were calculated to teach, was probably the reason why Gothic art took but little root in Italy, where it was ever regarded as of barbarian origin. When, in the fifteenth century, classical learning revived in Italy, and the art of printing disseminated literary treasures, a taste for classic art revived also. The style of ornamentation to which it gave rise, having been formed upon classic models, was called the Renaissance style, and the period of its glory the Restoration or Renaissance period.

A combination of architecture and decorative sculpture was a distinguishing

feature of the Renaissance style. Figures, foliage, and conventional ornaments were so happily blended with mouldings and other structural forms, as to convey the idea that the whole had sprung to life in one perfect form, in the mind of the artist by whom the work was executed. To Raphael (early in the sixteenth century), both sculptor and painter, we owe the most splendid specimens of the Arabesque style, which he dignified and left complete. Arabesques lose their character when applied to large objects ; neither are they appropriate where gravity of style is required.

All the great painters of Italy were ornamental sculptors also. Their sculptured ornaments were ingeniously arranged on different planes, instead of on one uniform flat surface, so as best to show the diversities of light and shade. Much of the splendid painting done by the Italian masters, from Giotto to Raphael, — from the year 1290 to 1520, — was mural decoration, now generally called fresco.

Elizabethan Ornament. — The revival of art in Italy soon spread over France and Germany, and about the year 1520 extended into England, where it soon triumphed over the late Gothic style. The true Elizabethan period of art embraced only about a century. It is simply a modification of foreign models, and has little claim to originality.

The characteristics of Elizabethan ornament may be described as consisting chiefly of a grotesque and complicated variety of pierced scroll-work, with curled edges ; interlaced bands, sometimes arranged geometrically, but generally flowing and capricious ; curved and broken outlines ; festoons, fruit, and drapery, interspersed with roughly-executed figures of human beings, grotesque monsters, and animals, with here and there large and flowing designs of natural branch and leaf ornament ; rustic ball and diamond work ; panelled compartments, often filled with foliage or coats of arms, etc. etc., — the whole founded on exaggerated models of the early Renaissance school. By the middle of the seventeenth century the more marked characteristics of the Elizabethan style had completely died out.

Concerning modern ornamental art little can be said in this lecture, because the subject requires a very extensive knowledge of all the ornamentation of any value that has been done since the decline of Elizabethan decoration. One thing, however, of very great importance, should be noticed. It is this : Modern design, as a whole, is almost entirely an emasculated revival of forms, — the patching up, so to speak, of the artistic inventions of centuries, without any regard to the subtle laws discovered and applied by ancient designers. Harmony, fitness, and adaptation do not seem to appear as motive powers in modern ornamentation. Go where we may, we are almost certain to discover lack of law, levity of choice, or paucity of thought. Beauty and utility are rarely found in the things exposed for sale, or in those offered to our sight by decorators. Perhaps the main cause of this falling away from the good and true in design, is the popular demand for those things that can be quickly disposed of, without the least regard to the great need in human nature of intellectual rest and perpetual joy. The cure for this state of things is sound art education for the people at large.

XXVIII.

HISTORIC SCHOOLS OF PAINTING DOWN TO
THE SEVENTEENTH CENTURY.

THE history of ancient art in all nations or countries seems to be a record of the rise and fall of their different forms of religion. The arts of India, Asia, Africa, Greece, Italy, and Spain have been controlled by, and were in a great measure dependent upon, the respective religions of those countries; and their degree of perfection seems to have been governed by the relative social position of artists in those countries and the respect in which they were held. In Greece, where religion was held in the highest esteem, art reached its greatest degree of excellence.

Judging from the remains of art in India, sculpture seems to have been pre-eminent among the arts—at least, we possess much better examples of it, owing perhaps to its greater durability; still there are a few remains of ancient painting extant in India. Indian art was, like that of all Eastern nations, purely symbolical and hieroglyphic, showing no knowledge of perspective or *chiaro-oscuro*.

Two periods are assigned to it,—the Braminical and the Buddhist,—to which all existing remains belong. The old Bramins, like the hierarchy of Egypt, held the arts under their control, and applied them essentially to religious purposes. In the neighborhood of the Ganges and the coasts of Malabar, painting has existed from a very remote period. The most important early examples of Indian painting are executed with a hair pencil in water colors, upon chalk grounds, and are remarkably clear and bright; but as regards form, light, shade, and composition, they resemble the crudest specimens of mediæval art in Europe. The characteristic designs were the symplegmata, or beast aggregates, consisting of bodies of many beasts or human beings united into one figure, commonly representing the attributes of their deities.

The modern Indians have practised portrait painting to a considerable extent, and are also acquainted with the use of oil colors; still they have no idea of middle tints or harmony of coloring. They possess great power as copyists, and their portraits are distinguished by the great exactness of the features, but are without individuality of expression.

The Chinese are brilliant colorists and exact in the rendering of detail, but they show a total lack of power in drawing the human form.

The Japanese excel their continental neighbors in beauty of design and knowledge of outline, and are more skilful in delineating the human figure.

It is extremely difficult to separate the history of painting in Egypt from that of sculpture, as it was subordinate to the latter. Being purely symbolic and historic in its representations, it was the tool of the powerful priesthood. All Egyptian pictures appear to be simple records, either social, religious, or political; and Egyptian painting was accordingly rather a symbolic writing than a liberal art. The history of art in Egypt may be divided into three periods, namely, those of the ancient, the middle, and the new empire; the first being that of the pyramid builders, and the second that which followed the expulsion of the Hyksos or Shepherd Kings, soon after which Rhamses the Great, or Sesostris, reigned. The period of the beginning of Egyptian art dates back to about B. C. 5000; and the third or Saitic period ends in B. C. 525, when Egypt was subdued by the Persians under Cambyeses, and became a Persian province. A fourth period embraces the style of Egyptian art under foreign influences, and may be divided into two epochs. The first epoch is that of the Ptolemies, from B. C. 332 until the death of Marcus Antoninus, B. C. 30. The second epoch is that of the Roman Emperors, after the conquest, from B. C. 30 to A. D. 638, when Egypt was invaded by the Arabs; thus this fourth period extends from B. C. 232 to A. D. 638.

Plato states that painters and sculptors were forbidden to introduce any change whatever into the practice of their respective arts, or in any way to add to them: thus their works remained uniform from one generation to another.

Painting in Egypt is undoubtedly of great antiquity and coeval with sculpture. One of the early pictures on record is an Egyptian painting of Amasis, who sent his portrait to the Greeks at Cyrene; and it is probable that it was in complete full face, painted upon panel, as such portraits have been found in mummy-cases, and are among the best specimens of Egyptian painting extant. Three classes of painting have been discovered in Egypt,—those on walls, on mummy-cases and on cloth, and those on papyrus rolls. The two latter are mostly hieroglyphic. All have a common character; none are strictly imitative, although enough so to be intelligible. One of their most striking characteristics is the brilliancy of their colors; paintings of the most ancient date, B. C. 4000, still show colors in their primitive freshness.

Beyond drawing, there is scarcely a principle of pictorial art yet discovered in any Egyptian painting. Relief is expressed by light and shade; animals and birds are generally rendered with perfect intelligence, especially in sculpture, in which they have a positive form, but in painting they are flat. In no painting is there the slightest trace of perspective. Egyptian art was not without its influence on all surrounding nations; and after the overthrow of Thebes by Cambyeses, the Persians carried home with them a large colony of Egyptian artists, whose influence is easily traceable in Persian art, it being evident that they worked under the influence of the Persian priesthood instead of their own.

Few if any productions of the Grecian pencil remain to enable us to form a judgment apart from the opinions of ancient critics, and the greater part of our information about them is drawn from the writings of Aristotle, Pliny, and other authors. Painting was in an advanced stage in Asia Minor before it made any great progress in Greece itself. In Egypt and Assyria, it had been employed merely as an accessory to heighten the effect of architecture and sculpture, but in Greece it first became an independent art. In the early Greek vases we are able to recognize the painter as an artist distinct from the sculptor and the architect. The most ancient vase paintings display considerable knowledge of the human figure, and of its right balance in action and in repose, combined with a feeling for beauty and grace, though there is no attempt at subtle combinations or gradations of color, — for the painter was limited to white, red, yellow, and black, — no indication of *chiaro-oscuro*, as in contemporary bas-reliefs, and no trace of knowledge of perspective. Nothing, on the other hand, can be more beautiful than the ornamentation of early Greek vases, in which different surfaces are contrasted with each other; or more spirited and graceful than the figures represented upon them, in spite of their strictly conventional treatment. The first painting on record is the Battle of Magnesia, by Bularchus, 718 B. C. With this the first era of Grecian painting begins. During five centuries the art had previously flourished in the cities and islands of Greece, and was practised by various masters; it passed through many gradations, from the simple shadow painting, the monograph of simple outlines, to monochromatic and polychromatic compositions.

From the middle of the sixth century, a decided improvement commenced in painting. Cimon of Cleonæ lived about 520 B. C.; he is recorded as the inventor of foreshortening, or as the first who took oblique views of the figure; he also first marked articulations, indicated veins, and represented folds naturally in drapery. A century later, Polygnotus of Thasos lived at Athens, 463 B. C., and decorated the celebrated portico *Pœcile*, and the *Lesche* or public hall at Delphi. He had great command of color, and power of depicting multitudes in a spirited and lifelike manner; he attempted only profile figures, and painted shadows in a purely rudimentary manner. At Delphi, the figures were apparently arranged in zones and groups, one above another, with no use of linear or aerial perspective. The style of Polygnotus is to that of the Alexandrian period, what the Florentine school, in the time of Michelangelo, was to that of Bologna subsequent to the Caracci. There is a memorable passage in the *Poetics* of Aristotle regarding this painter. He says that "imitation must either be superior, inferior, or else equal to its model"; and he illustrates these remarks by instancing the style of three painters. "Dionysius," he says, "paints men as they are, Pauson worse, and Polygnotus better than they are." Improvement was carried on for half a century by Mycon, famous for his horses; Pauson, his rival; Dionysius of Colophon, praised for minute accuracy; Aglaophon, for boldness and energy; Colotes, sculptor and painter; Erenor, father of Parrhasius; and finally, greatest of all, Apollodorus the Athenian, who invented and perfected

the knowledge of light and shade. With this artist terminates the second era, about the commencement of the fourth century B. C.

The third era, which commences with Zeuxis, is distinct at once in principle and excellence. Preceding masters had crowded their tablets with figures: he introduced simplicity of composition, and frequently relied upon the perfection of a single figure as a concentrated point of interest. He was also simple in his coloring, never using more than four, often only two pigments. Parrhasius equalled Zeuxis in expression, and seems to have surpassed him in color. Their contemporaries and followers were Euphranor, Timanthes, Theon of Samos, and Aristides of Thebes. The Asiatic school, founded by Parrhasius, Zeuxis, and their followers, was distinct from the older Grecian school, which had its seat at Athens.

The Alexandrian period has been termed the period of refinement in painting. The characteristics of the painters of this time lay rather in greater variety of effect and execution than in any essential qualities of art. The various masters differed chiefly in external qualities, and much the same transition from the essential to the sensuous took place in the Greek schools of painting in the time of Alexander, as in the schools of Italy in the seventeenth century.

The celebrated school of Pamphilus was established at Sicyon in the early part of the fourth century B. C., and effected important results in Greek art. The course of study occupied ten years, and comprehended instruction in drawing, arithmetic, geometry, anatomy, and paintings in all its branches. Pamphilus was a kind of Leonardo da Vinci, the first painter, says Pliny, who was skilled in all sciences, particularly arithmetic and geometry, without which he denied that art could be perfected. His pupils were Apelles and Melanthius, Protogenes of Cannus, Nicomachus and Aristides, Theban brothers, Pausias of Sicyon; Nicias, of Athens; Euphranor the Isthurian, Athenion of Maronea, and Theon of Samos, all of the greatest fame and nearly all distinct in character, though probably on an equality in the general character of their design and execution.

The fourth era of Grecian painting commences with Apelles, about the end of the fourth century B. C. In him Greek art reached its fullest development. His chief characteristics were his feeling for grace and beauty, his skill in portraiture, and the chaste simplicity of his coloring; he united in his style the scattered excellences of his predecessors and contemporaries. From the descriptions of ancient writers his style must have closely resembled that of Raphael, while his choice of subjects appears to have been similar. His age witnessed both the glory and fall of ancient art. After the death of Alexander, painting steadily declined: the grand style was still cultivated for many centuries, but a marked preference was shown for the realistic style and for painting of a secondary class, now called *genre*. The most celebrated Greek *genre* painter was Pyreicus, who painted shops, and still life of every description. Caricature was also greatly in favor in this degenerate age.

The enthusiasm with which the Etruscans cultivated the art of painting is manifested in the many mural paintings discovered in their tombs, in which the gradual development from the conventional Egyptian style to the perfected Greek may be traced. In the earlier specimens we see the straight lines,

the oblong faces, and the parallel folds of drapery common in Eastern sculpture, while in the later we find the easy grace of Greek art.

No great school of classic painting ever flourished in classic Rome: all works were by Greek artists or reproductions of Greek masterpieces. The Roman emperors, on the subjugation of Greece, robbed it of its treasures of art to embellish their own land. There were three periods in the history of painting in Rome, — the first, or Græco-Roman, begins with the establishment of the Empire; the second extends from the time of Augustus to that of Diocletian; and the third is reached under Constantine, the period of decay, in the beginning of the fourth century. The pictures found at Pompeii and Herculaneum, at the Baths of Titus, and in the numerous subterranean tombs near Rome, are painted in distemper; no true fresco painting has as yet been discovered, although some of the walls are colored in fresco. The leading peculiarity of these paintings is the intensity of their coloring, accounted for by the well-known custom in Italy of darkening rooms in the day-time, the lower portion of the walls being painted in the strongest colors, the upper in white or very faint tints, thus giving repose to the eye. The paintings of the Baths of Titus surpass those of Pompeii; they contain the arabesques from which Raphael took his ideas for the decoration of the Vatican, and are remarkable for imagination, variety, and harmony of coloring. Roman painting, properly so called, was chiefly portraiture, in which considerable excellence appears to have been obtained. Marcus Ludius was a celebrated portrait-painter and decorator in the time of Augustus; he combined beauty of composition with truth of character: but Roman artists never got beyond the simplest effects of light and shade, or the most rudimentary knowledge of perspective. Numerous specimens of Roman mosaic have come down to us. The mosaic in the celebrated house the “Casa del Fauno” at Pompeii, which is supposed to represent one of Alexander’s battles, displays thorough command of foreshortening and perspective, and is probably a copy of some famous ancient work.

Ancient art, as distinguished by its characteristics, may perhaps be said to have died out at about the close of the third century of the Christian era. The establishment of Christianity, the division of the empire, and the incursions of the barbarians were the first great causes of the decay of the imitative arts and the serious check which they received. The fury of the iconoclasts or image-breakers effectually destroyed all traces of ancient art. The foundation of Constantinople and the establishment of the Exarchate at Ravenna were serious blows to the magnificence of Rome. Byzantium, the Rome of the East, became enriched by the spoils of all the principal cities of Europe and Asia, and outshone Rome itself. During the period of persecution the sole attempt at anything like art among the early Christians was in the decoration of the catacombs. These were ornamented with simple frescos during the first two centuries, and owing to the hatred of everything which could recall the old idolatry, symbols alone were employed. As Roman power declined and with it its monopoly of art forms, the love of art innate in every native of Greece and Italy, once more asserted its sway, and in the third and fourth centuries the early Christians were permitted to adorn the catacombs with

something more than formal signs : thus Christ is then represented as The Good Shepherd, and as Orpheus taming the beasts with his lyre. In the paintings of the fifth century we note a further advance : the portrait of Christ differs essentially from the old Greek idea and is of a purely Christian type.

The chief characteristics of early Christian painting as exhibited in the catacombs, are a simple earnestness and majesty, and a grandeur of composition but little inferior to the frescos of the best age of the old empire, combined with what we may call a spirituality peculiarly their own. On the recognition of Christianity as the religion of the State, in the time of Constantine, Christian painting was called upon to decorate the vast basilicas and churches appropriated to the new worship. At first tempera and encaustic colors were employed, but were soon supplanted by mosaics. The only existing remains of the fourth century are of a purely decorative character. In the fifth and succeeding centuries, attempts were made to produce historical pictures in mosaic, but the intractability of the material led to a general preference for subjects which could be treated simply. As we advance further and further from the times of persecution, we note an ever-widening difference between the paintings of the catacombs and the church mosaics : the spirit which had unconsciously influenced the artist of the catacombs is almost extinct ; the symbolism is gone, and instead of scenes of suffering and death we have the Saviour enthroned in glory. The Virgin was not represented until the latter part of the fifth century. In the fifth century, mosaics were produced, now considered the best in Rome, in which the saints appear in natural groups and attitudes, instead of in the stiff, parallel rows subsequently adopted. The whole period, from the establishment of Christianity in the fourth and fifth centuries, until the revival of arts and letters, has been termed the Dark Ages. Fallen as every liberal pursuit was at that time, painting was still never extinct. Incessant wars, pests, and famines had driven all studiously inclined persons to seek the retirement and protection of the cloister, and had rendered the convents the conservatories of literature and the arts ; among these, that of St. Gall, of Switzerland, is particularly noticed for having produced the most celebrated German sculptors, painters, and gold-workers of their time.

The illumination of manuscripts, which flourished in the time of Charlemagne, is considered as a connecting link between ancient and modern painting. The Anglo-Saxons were for a long time the best illuminators ; the Irish also held high rank, while the Byzantines surpassed the Latins.

Soon after the conquest of Italy by the Lombards, Christian art branched off into two schools, to which the names of the late Roman or Byzantine have been given. It did not rise to importance until the sixth century, and its predominance marks the deepest decline of Italian art. The leading characteristics of Byzantine painting, which it has retained until the present day, are the use of flat gold grounds instead of the blue hitherto preferred ; a stiff treatment of the human figure ; rigid, conventional forms, wholly devoid of beauty ; and great neatness and carefulness of execution. The ardent controversy as to the personal appearance of Christ, in which the

Romans maintained that he "was the fairest of men, and the Byzantine Greeks that he had no beauty of person, exercised a great influence on the art of the East and West, and accounts in a great measure for the difference in the treatment of sacred subjects by the two schools.

Until the thirteenth century Venice was little more than a Byzantine colony, and the mosaics of St. Mark are very pure examples of Byzantine style. In decorative painting the geometrical mosaics are very ingenious in pattern and always good in color. From the thirteenth century Byzantine art steadily declined. The formative arts made a surprising and comparatively sudden progress in the thirteenth century. The Latin conquest of Constantinople in 1204, by which Greek artists were established in Italy, as well as the fusion of the conquering races of Sicily, the Normans and the Arabs, contributed to this result. The distinctive feature of the revival of art is that it became imitative as well as representative, although in the first two centuries the imitation was more imaginative than real. The art of looking at Nature had to be learned before she could be imitated. Among the first painters to take part in the new movement were Giunta, of Pisa; Guido, of Sienna; Bonaventura Berlinghieri, of Lucca; Margaritone, of Arezzo (1236—); Maestro Bartolommeo, of Florence; and Andrea Tafi (1213—), the greatest mosaic worker of the thirteenth century, — all Byzantine in style, but affected by the stirring of a new life in art.

In the works of Giovanni Cimabue (1240-1302), the founder of modern Italian painting, there is a decided advance in the representation of form and in the expression of action, although his figures are still of the long-drawn Byzantine type. He is the first great painter of the Florentine or Tuscan school. His most distinguished contemporary was Duccio di Buoninsegna, of Sienna, who was to the school of Sienna what Cimabue was to that of Florence. Italian painting in the time of Giotto branched off into two distinct styles, which are expressed by two schools, those of Florence and Sienna. The Florentines derived their practice, to a certain extent, from the early Siennese masters, and were distinguished for vigor of conception and richness of composition. The Siennese were distinguished for warmth of feeling and grace in the treatment of single figures. At the head of the Florentine school stands Giotto (1276-1366), who was the first to free himself from Byzantine tradition, and who exercised a lasting influence on art in every part of Italy. His constant study of nature and steadfast resistance to all that was false or unreal in art effected a great reformation in painting. In knowledge of form and perspective he was deficient; but his force of conception, his power of preserving a right balance in complicated groups, and of expressing natural character, and his feeling for grace of action and harmony of color, justly entitle him to be regarded as the founder of the true ideal style of art, and the restorer of portraiture. Giotto's colors were lighter and more roseate than those of his predecessors, and were mixed with a thinner medium. The principal scholars and imitators of Giotto, known as the Giotteschi, who worked in his style, were Taddeo Gaddi (1300-1367), Andrea Orcagna (1316-1376), and Tommaso di Stefano, or Giotto. The painters of the

Siennese school aimed rather at spiritual expression than at an exact imitation of corporeal form. The chief was Simone di Martino, or Simone Memmi (1284-1344). His followers were Pietro and Andrea di Lorenzo, and Barna or Barna (— - 1380). While painting was progressing in Tuscany it was making nearly equal advancement in Umbria, Rome, Venice, and other parts of Italy. The early Florentine and Umbrian painters had few distinctive peculiarities, and the early masters of the Roman school were greatly influenced by Giotto. Of these, Pietro Cavallini (1259-1344?), painter, architect, and mosaic worker, was the most important. Towards the end of the fourteenth century great progress was made at Rome, and many artists rose in fame, the chief of whom was Gentile di Fabriano, the Umbrian master of Jacopo Bellini, a fine colorist (1370-1450). In Venice the struggle against Byzantinism lasted long, and it was not until the last half of the fourteenth century that the yoke of tradition was finally broken. The famous names of this time were Maestro Paoli (1346) and Lorenzo Veneziano.

Mural painting was practised with great success in Germany and in France in the Romanesque period, which includes the eleventh, twelfth, and thirteenth centuries. The best examples are in Germany. They follow the antique, and are distinguished by simple earnestness and dignity, powerful coloring, and appropriateness as architectural decorations. The rise of the pure Gothic style was unfavorable to the progress of painting in the north of Europe, the walls of churches being reduced to narrow piers; but it was atoned for by the growth of the art of glass-staining, which was carried to perfection in the Gothic period. William of Cologne (1380) is the earliest German painter on record. Stephen of Cologne was his pupil, and Israel von Mechenen, painter and engraver of the sixteenth century, excelled all others. The school of Nuremberg attained a high rank in the fourteenth century. The works of the early German schools are painted on panel with gold grounds, and are distinguished for depth of coloring and careful execution of details. In the technical use of water colors the painters of these schools excelled all their contemporaries and predecessors, their works having as fine an effect as oil.

The decorative painting of the Middle Ages, at first purely geometrical, became gradually complicated by the introduction of the heads of animals or birds, and the profuse use of the grotesque element which formed so distinctive a feature of Gothic art.

The fifteenth century was a period of exceptional intellectual activity, and the progress made in scientific discoveries was of great importance to the arts. A considerable advance had been made in expression and imitation in the thirteenth and fourteenth centuries, but oil painting was still unpractised, portraiture was little cultivated, perspective very imperfectly understood, and landscape painting not even attempted. At the beginning of the fifteenth century, however, the introduction of oil colors, the scientific study of perspective, form, and color, and a constant demand for frescos on an extensive scale, led to a progressive movement in Italy which culminated in the sixteenth century. During this time schools arose on every side characterized by

excellence in one or another element of art. Until 1450 Florence led them, but from that date the Neapolitan, Umbrian, Bolognese, Venetian, and Paduan schools rose into almost equal importance. The artist who contributed most to the pre-eminence of Florence in the early part of the fifteenth century was the sculptor Lorenzo Ghiberti, in whose school the leading painters of the day were formed. He perfected the imitation of nature, and applied the sciences of anatomy, mathematics, and geometry to the art of design. His pupils were Paolo Uccelli (1396-1479), who gave his attention to perspective; Masolino, who advanced the knowledge of chiaro-oscuro; and Masaccio (1402-1429), who excelled all his predecessors in form, expression, and composition. His contemporaries, Fra Angelico da Fiesole (1387-1455) and Fillippo Lippi (1412-1469), who is named as a scholar of Masaccio, are representatives of the two great classes into which the painters of the Renaissance became divided, — naturalists and mystics or idealists, the former aiming at beauty for its own sake, studying earnestly everything connected with the theory and practice of their art, the latter cultivating beauty as the expression of all that is highest and best in the material and spiritual world. Angelico's works embody the two great requisites of ideal art, expression, and pictorial power. Fillippo Lippi was one of the first to paint in oil, and to cultivate the sensuous side of art; he was the first to introduce landscape backgrounds. Other painters of these schools were Lippi's son Fillippino (1460-1505), Benozzo Gozzoli, Andrea Castagno (1403-1477), Sandro Botticelli, Domenico Corradi or Ghirlandajo (1451-1495), remarkable for portraiture, Luca Signorelli, and others.

The founder of the Paduan school was Francesco Squarcione (1394-1474), who revived the study of antique sculpture. The peculiarity of the Paduan school was a sculpturesque rather than a pictorial treatment of form, its works resembling bas-reliefs rather than paintings.

In the school of Venice brilliancy and harmony of coloring reached their fullest development. It was founded by the Bellini brothers, Giovanni (1426-1516) and Gentile (1421-1507). Giovanni was the superior. He had many famous scholars, — Giorgione, Titian, Cima da Conegliano (1489-1577), Marco Basaiti (1470-1520), and the brothers Vivarini. All were influenced a little by the Paduan school, and combined something of its severity of form with Venetian softness of coloring.

The mountainous district of upper Italy was the home of a school of painters who cared rather for spiritual beauty than external perfection of form. The works of the early Umbrian masters remind one of the early Florentine. Nicolo Alunno, the master of Perugino, gave the school its distinguishing characteristic of spiritual expression, a characteristic more fully displayed in the works of Perugino (1446-1524), who was famous for his coloring and knowledge of perspective. His famous pupils were Pinturicchio (1454-1513), Giovanni di Pietro or Lo Spagna (died 1530), the still greater Raibolini or Francia of Bologna (1450-1517), and, greatest of all, Raphael.

In the fifteenth century the Neapolitan school rose into considerable importance; its distinguishing peculiarity was the blending of Flemish and

Umbrian features ; the details, accessories, and landscape backgrounds remind one of the Van Eycks, and the figures of those of the Umbrian masters. Its chief painters were Antonio Solario (1382-1455), Giovanni Antonio d' Amato, and Silvestro de Buoni.

One other great Italian master must be mentioned before we enter the Golden Age of painting. Fra Bartolomeo (1469-1517), or Baccio della Porte, or Il Fratere, was the pupil of Cosimo Roselli and the contemporary and friend of Leonardo da Vinci, Raphael, and Michelangelo, and belonged to the early Florentine school. His works are distinguished for the holy expression of the heads, the grandeur and grace of the draperies, and the beauty of the architectural backgrounds of his pictures. He invented the wooden or lay figures, so useful in studying the fall of drapery.

Before entering upon the sixteenth, let us look back upon progress in the fifteenth century. Imitation of nature was no longer imaginary, but real ; the laws of perspective were fathomed and applied by Uccello, Pietro della Francesca, Signorelli, and their followers ; great improvement was effected in form, anatomy, and physical beauty by Ghiberti and Masaccio at Florence, Squarcione at Padua, and Mantegna at Mantua ; spiritual beauty was embodied in the works of Fra Angelico and Fra Bartolomeo at Florence, Perugino at Rome, and Francia at Bologna ; while the true principles of coloring were carried out at Venice by the Bellini, Vivarini, and others. Thus the way had been opened for the advent of the great masters. The names of pre-Raphaelite and Quattro-cento have been given to the painters of the fifteenth century.

The early part of the sixteenth century was for Italian painting what the age of Pericles had been for Greek sculpture. We have seen the various elements of excellence in painting, each forming the distinctive characteristic of some one school ; but we have now to examine these elements, as they appear blended in one harmonious whole, in the works of the five great masters of Italy, — Leonardo da Vinci, Michelangelo, Raphael, Titian, and Correggio, — each of whom united command over every art element with special excellence in some particulars.

Leonardo da Vinci was born at Vinci, near Florence, in 1452. He was a universal genius and endowed with exceptional beauty of person. He was sculptor, painter, musician, and poet, and had a thorough practical knowledge of architecture, mechanics, anatomy, botany, and astronomy. His mind, like a mirror, received and reflected in added brightness every ray of intellectual light that fell upon it, and in his researches he anticipated the march of three centuries. At thirty years of age he was called to the court of Ludovico Sforza, Duke of Milan, and intrusted by him with the foundation of a school of art. In 1499 he returned to Florence, and in 1503 he was commissioned to paint one end of the Council Hall in the Palazzo Vecchio, of which Michelangelo was to paint the other end. The cartoons of both were distinguished for the anatomical correctness of the figures, and from this period the development of mere physical qualities became the predominating characteristic of the Florentine school. In 1517 he went to France, in the service

of Francis I, and died at Amboise in 1519. His chief characteristics are mastery of chiaro-oscuro, grandeur of design, elevation of sentiment, and dignity of expression, whilst his pupils are distinguished for what may be called a reflection of his spirit, especially in the transparency of shadows and sweetness of facial expression. Of these pupils, Bernardino Luini (1480-1530) was the chief; also Andrea da Solario, Marco d' Uggione, Francisco Melzi, and Cesare da Sesto. The celebrated Gianantonio Razzi caught much of his peculiar manner.

Michelangelo Buonarroti was born at Arezzo, near Florence, in 1475, and died at Rome in 1564. He was poet, painter, sculptor, and architect, but unlike Leonardo, who gave his attention to light, shade, and color, he devoted his life to the study of form, and the expression of energy in action. He studied under Ghirlandajo. Up to 1503 he was known only as a sculptor; he then made his cartoon for the Council Hall at Vecchio, and in 1512 painted the frescos of the Sistine Chapel. His mighty spirit found its best exponent in sculpture: he despised easel-pictures as unworthy of a great man. His frescos have the same fire and energy as his sculptures. His art was creative, not imitative. Viewed in themselves, the frescos of the Sistine Chapel present astonishing evidences of human power: all is action; every form, every muscle, every attitude exhibits the very highest power of anatomical art, for each is displayed and exerted to the utmost; even repose is unrest. To this display of capabilities he sacrificed truth, simplicity, feeling, and real beauty. As in sculpture, so in painting: color, tone, light, shade, — all are systematic and ideal, and all mighty and overpowering. He made both sculpture and painting subservient to the loftiest aims, and no artist ever attained a higher fame; but the greatness of Michelangelo is his own — not the grandeur of art. Of his pupils, the best were Marcello Venusti, Sebastian del Piombo, and Daniele Ricciarelli da Volterra.

Contemporary with Michelangelo were Fra Bartolomeo, distinguished for softness and sweetness of coloring, and Andrea del Sarto (1489-1530), who was of considerable excellence as a colorist. Another contemporary of the mighty Florentine, but most unlike in all the characteristics of genius save the final result, was Raphael, the founder and master of the Roman school.

Raffaello Sanzio or Santa da Urbino, was born in 1483, at Urbino. Pupil of Perugino, he was at first greatly influenced by him, and adopted his style. His later styles were the Florentine and the Roman. No artist ever exercised so lasting an influence upon art as Raphael. In his works the influence of the intellect and the affections are inseparably blended, and this union of the highest faculties pervades everything from his hand. He exhibits in the highest degree the combination of the powers of invention with those of representation. In invention, composition, moral force, fidelity of portraiture, and spiritual beauty, he is surpassed by none; in grandeur of design by Michelangelo alone; and in fulness of coloring only by the best masters of the Venetian school. Although he died in 1520, at the age of thirty-seven, he executed two hundred and eighty-seven pictures, and five hundred and seventy-six drawings and studies, not including his frescos at the Vatican and

elsewhere. He possessed the marvellous power of fusing with his own peculiar gifts all that was best in the works of others, and thus built up a lofty and independent style essentially his own. In 1508 Raphael was called to Rome to assist in the decoration of the Vatican, and then began to paint the unrivalled frescos commemorative of the spiritual and temporal power of the papacy. The decorative paintings accessory to the frescos and the ornamental stucco work in the Loggie are unequalled. No painter has ever done so much to promote real excellence in art. All that imagination can lend to strictly imitative art he has added, yet he has infused the warmest sensibilities of life into its creations ; to Nature he has given all that grace and fancy can bestow consistent with the sweetest of all charms, namely, her own. In the words of Kugler, "His works were regarded with religious veneration, as if God had revealed Himself through Raphael as in former days through prophets." Raphael's pupils and followers were extremely numerous, and many of his excellences were successfully imitated by them. His most famous scholars were Giulio Romano (1492-1546) and Francesco Penni (1488-1528). Other followers were Perino del Vaga, Giovanni da Udine, Innocenza da Imola, Bagneavallo, Garofalo, and Dosso Dossi.

While form and expression were almost exclusively cultivated at Florence and Rome, chiaro-oscuro and color were perfected in the north. Antonio Allegri called Correggio from his birthplace (1495-1534), introduced a totally new manner in the art of painting, and excelled all in his chiaro-oscuro, and in grace and softness of effect. He was the founder of the Lombard or Parmesan school, and early in his career was much influenced by Leonardo da Vinci. Sir Joshua Reynolds says, "He had a most free and delightful pencil, and it is to be acknowledged that he painted with a strength, relief, sweetness, and vivacity of coloring which nothing ever exceeded." He understood how to distribute his lights in a manner wholly peculiar to himself, which gave great force and roundness to his figures. Correggio had no pupils of eminence, but many imitators, among whom Francesca Mazzola, known as Parmigiano (1503-1540), was the chief.

Far from the influences at work among the artists of upper Italy, the Venetians, by closely following the course marked out by the Bellini, became consummate masters of coloring. Seeking beauty for its own sake, they found it by transfiguring Nature, and their works reflect the splendor and magnificence which surrounded them. The Venetian painters cultivated the sensuous rather than the intellectual side of human nature ; and in their works faithfulness of pictorial representation is even of greater account than the moral lesson to be conveyed. They rendered the warm coloring of the flesh and the effect of light on different materials with wonderful accuracy and in a manner never surpassed. Giorgio Barbarelli, or Giorgione, was the first to break loose from the trammels of the early Venetian school. His works are distinguished for poetic feeling, imagination, and vigor of touch. Sebastian del Piombo was a scholar of his. But the greatest ornament of the Venetian school was Tiziano Vecellio, or Titian (1477-1576). In coloring he stands pre-eminent ; his rendering of flesh-tints has never been surpassed ;

and in his landscapes and groups, his treatment of local coloring and chiaro-oscuro has seldom been equalled. He is considered the finest portrait painter of any age. In his mastery of color, three principles may be remarked: first, the interposing medium between the eye and the object is supposed to be a mellow, golden light; second, the most glowing and gorgeous lights are produced, not so much by rich local tints, as by the general conduct of the whole piece, in which the gradations of tone are almost evanescent, yet in their strongest hues powerfully contrasted: hence the final splendor is produced by painting in undertones rather than by lavishing on particular spots the whole riches of the palette; the shadows and undertones are also enlivened by a thousand local hues and flickering lights, and the masses by innumerable variety and play of parts, and yet all are softened and blended and combined into an undefinable harmony. The third principle refers to his practice: the colors are laid on pure, without mixing, in tints, by reiterated application, and apparently with the point of the brush. He lived to the age of ninety-nine, and died of the plague in 1576. His contemporaries were Jacopo Palma (1516-1548); Paris Bordone (1500-1570); Pordenone (1486-1540); Alessandro Bonvicino, or Il Moretto da Brescia (1490-1560); and Moroni (1474-1529). Greater than any of these were two Venetian masters, Jacopo Robusto, or Tintoretto (1512-1594), and Paolo Cagliari, or Paul Veronese (1528-1588). Jacopo da Ponte, or Il Bassano (1510-1592), was one of the earliest Italian *genre* painters.

The great Italian masters of the Renaissance devoted no inconsiderable portion of their time and energies to decorative painting, and in their hands it attained a perfection never before reached, except, perhaps, in the best days of Rome. The early part of the fifteenth century was marked by a kind of transition from Gothic ornament, in which the grotesque element predominated, to that of the complete Renaissance, which was a revival of the antique style studied in the Baths of Titus, and stamped with the original genius of Raphael, who did more than any other master to define the true limits and capabilities of decorative art. In the sixteenth century a desire was felt for greater variety of design; as the century advanced, this love of variety increased, and ideas were borrowed from the East. In our retrospect of the sixteenth century we find form, design, and expression perfected in the Roman and Florentine schools by Michelangelo, Da Vinci, and Raphael; coloring and chiaro-oscuro in the schools of Venice and Parma by Titian, Correggio, Tintoretto, and Paul Veronese; spiritual beauty had found its noblest exponent in Raphael, and corporeal beauty in Titian; the art of portraiture had attained its highest development; landscape painting, properly so called, had been improved, and *genre* painting had been introduced. A general love of art pervaded all classes of society. Unfortunately, the high position painting had thus gloriously attained, was not maintained, and even at the close of the sixteenth century there were signs of its approaching decadence.

XXIX.

HISTORIC SCHOOLS OF PAINTING.

(Continued.)

IN the north of Europe, as in Italy, we find that painting attained a position of first-rate importance in the fifteenth and sixteenth centuries ; but it differed in many essential particulars from that of the south. The northern masters went to nature for their models, and endeavored to express their spiritual conceptions in the familiar forms and homely scenes of every-day life, attaining thereby a truth to nature never surpassed. It cannot, of course, be denied that these men never attained the exceptional excellence of Da Vinci, Michelangelo, or Raphael, but their inferiority was in a great measure due to accidental and peculiar circumstances. In the north, there were no enthusiastic patrons of art, ready to recognize and encourage genius ; artists were compelled to work their way to eminence through difficulties of every kind, and, above all, the Reformation, which occupied the thoughts of all earnest men, threw every other interest into the background. Notwithstanding these disadvantages, the simple truthfulness of painting in the northern schools, its faithful rendering of individual character, its purity and distinctness of expression, and thorough originality, give it a charm and value of its own.

The earliest distinct development of the German style occurred towards the end of the fourteenth century, in the school of Cologne. William of Cologne is the earliest tempera painter of this school, and the oldest German painter to whom existing panel pictures are attributed. Meister Stephan is a more distinguished painter ; his greatest work is considered the masterpiece of the school. The pictures of this school have gold backgrounds, but their characteristics are in other respects those which may be observed for ages in northern art with remarkable uniformity. The German imitated nature earlier than the Italians, but never succeeded, like them, in the representation of the beautiful and ideal. Their faces are nearly always full of character, but the drawing and modelling of other portions of the figure exhibit structural ignorance. They never generalize, but concentrate their attention upon minutiae of detail ; yet in all technicalities they pre-eminently excel, and are almost invariably fine colorists. In composition they are inventive, but their creations are singular and fantastic. Another early German school is that of Westphalia, a school similar to that of Cologne.

The most celebrated northern school of the fifteenth century was the Flemish school of Bruges, established by Hubert Van Eyck, and upheld after his death by his brother John. Hubert Van Eyck (1366-1426) occupied a position somewhat similar to that of Masaccio and Mantegna in Italy. His chief claim to distinction rests not on the invention of oil colors, but on the removal of the obstacles to their employment for important works, and on the wonderful power, transparency, depth, and harmony of coloring which he acquired by their use. Up to this time, oil colors were practically useless for any but minor purposes, as, in order to quicken the drying of the colors, a varnish of oil and resin was used, which fatally injured their brightness. Van Eyck, by using a colorless varnish, obviated this difficulty, and by judicious underpainting attained an admirable balance in his tones and shadows. His manner combined the most profound and genuine realism, with something of the idealism and symbolism of the Middle Ages. He gave to all his works a dramatic and picturesque cheerfulness certainly never surpassed by any Italian master; but his designs are stiff and his outlines hard. Jan Van Eyck (1390-1440) received instruction and formed his style from his brother's works. In coloring, especially in flesh-tints, he was pre-eminently successful, and his landscapes and portraits are remarkably true to life; but he was wanting in feeling for spiritual beauty. His masterpiece, a portrait, is exquisitely finished, and the coloring and chiaro-oscuro is equal, if not superior, to anything produced at this early period of the fifteenth century. Among the principal scholars of the Van Eycks is Van der Weyden (1390-1464), who exercised even a greater influence over his contemporaries than the Van Eycks had done. In his school were Hans Memling, the greatest Flemish, and Martin Schöngauer, the best German master of the fifteenth century. In Hans Memling (—-1495) the school of the Van Eycks reached its fullest development; his works excel those of any of his predecessors in delicacy of execution, softness of outline, and feeling for grace and beauty. He also effected considerable improvement in coloring, chiaro-oscuro, and aerial perspective, but was not so successful in finish of detail.

Towards the close of the fifteenth century we meet with Quentin Matsys (1444-1531), the greatest Flemish painter of his day, whose works are remarkable for beauty of form, delicacy of finish, solemnity of feeling, and softness and transparency of coloring. His draperies have an easy grace, rare in the pictures of his school; his sacred pictures are grand and dignified. The influence of the Flemish school extended over Holland and Germany.

In the fifteenth century the Dutch school was little more than an offshoot of that of Bruges; its chief representatives are Albert Van Ouivater, its founder, one of the earliest landscape painters of Holland, Dierich Stuerbout (1391-1463), the first great Dutch painter who excelled in design, and Jan Van Mabuse (1470-1532), who preceded Holbein in showing British artists what might be effected by honest study of nature. The latter part of the fifteenth century and the whole of the sixteenth are looked upon as a transition time, Flemish and Dutch art not having reached their highest development until the seventeenth century.

In the sixteenth century an unfortunate attempt was made to combine the peculiar excellences of the school of the Van Eycks with those of the Italian Cinque-cento masters. Towards its close numerous Dutch and Flemish historical painters arose, who paved the way for a higher and more independent style of art. Their works display great truth to nature and force of character, careful drawing and fulness of coloring. A great impulse was given to the art of landscape painting at the close of the sixteenth century, by the Brothers Brill of Antwerp. Paul Brill (1556-1626) was one of the first to obtain harmony of light in landscapes, and he greatly influenced for good the future masters, Rubens and Claude Lorraine. At this time we also meet with the first Dutch marine painters.

Previous to the sixteenth century we find German painters expressing in their works unwavering devotion to the Church of Rome, and unflinching allegiance to the traditional mode of treating sacred subjects; but in the sixteenth century we meet with men imbued with the spirit of the Reformation, hinting in their sacred pictures at a real and personal conflict between spiritual and mental agencies. This, more than any other peculiarity, separates the art of Germany from that of Italy, with its beautiful idealization even of the powers of evil, and from that of Flanders, with its stern repudiation of all not actually manifest to the senses. At this time we find two great schools in Germany, the Suabian (including the schools of Ulm and Augsburg) and the Franconian schools. The school of Augsburg is characterized by a more decidedly realistic tendency than that of Ulm. At the head of this school stands Han Holbein the Elder (1450-1541), father of the great Holbein who did so much for English art in the reign of Henry VIII. In this school the influence of the Van Eyck school is very noticeable. Hans Holbein the Younger (1498-1543) was not only the greatest German exponent of the realistic school, but one of the first portrait painters of any age. Inferior in grandeur of style and fertility of imagination to his great contemporary Dürer, he excelled him in truth to nature, feeling for physical beauty, and command over all the technical processes of his art. He was the one German master who freed himself from that conventionalism in the treatment of the human form which had so long prevailed; and his portraits have an individuality of character and clearness of coloring superior to anything of the kind ever produced in Germany. Other masters of the Suabian school are Sigmund Holbein (1465-1540), uncle of the great Holbein, Martin Schaffner (1508-1541), Hans Burgkmair (1493-1559), etc.

In the school of Franconia, with Nuremberg for its headquarters, we find the same tolerance of ugliness and the same sharpness of outline, as in the works of the early Dutch and Flemish masters, combined with an intensity of expression and a delight in the weird and fantastic even greater than in the Suabian school. Albert Dürer (1471-1519) was the father of modern German painting. He was among the first to bring the laws of science to bear upon art, and to demonstrate the practical value of perspective. He excelled alike in painting, engraving, sculpture, and wood-carving. The characteristics of his paintings are forcible drawing, breadth of coloring, individuality of char-

acter, and vitality of expression, combined unfortunately with a certain harshness of outline, an occasional stiffness in the treatment of drapery, and a want of feeling for physical grace and beauty. Dürer exercised a powerful influence throughout the whole of Europe, and had many followers and imitators. Of his pupils, Altdorfer (1488-1538), a painter and engraver, is the greatest. Grünewald (1460-1530) and Lucas Cranach, his master, were contemporaries of Dürer. Towards the close of the sixteenth century the peculiar character of German art, like that of Dutch and Flemish art, was lost in a general imitation of the great Italian masters.

In the beginning of the seventeenth century we notice a revival of painting in the north, characterized by a return to the realism of the Van Eycks, combined with something of the Venetian breadth, harmony of coloring, and general balance of tone.

French art, viewed historically, is a branch of the Roman school. Francis I, although a liberal patron of native art, always showed a marked preference for the works of Italian masters, and did comparatively little to encourage native talent. The true Italianized French school dates from the time of Francis I, who invited celebrated artists from Italy to decorate his palace; its chief representatives flourished in the seventeenth century. In the fifteenth and sixteenth centuries we meet with the earliest French painters of distinction, and the only French masters who cannot be said to belong to the Italianized school of the sixteenth century, namely, Jean Fouquet (—-1485), a miniature painter, the three Clouets (—-1574), and Jean Cousin (—-1560), who was architect, sculptor, and painter. They belonged to what may be termed the Gothic school, and painted somewhat in the manner of the Van Eycks, though with less knowledge and ability.

The native school of England is of comparatively recent date. What the Italians did in Spain and France was done by Flemish and German masters in England. The zeal of the Reformers and Puritans has deprived us of nearly every vestige of early English painting and sculpture. The most important early English works of which we have a record were executed in the reigns of Henry III and Edward III, and by William Austin, a celebrated artist in the reign of Henry VII, who seems to have been but little inferior to his celebrated Italian contemporaries, Donatello and Ghiberti. It was during the reign of Henry VIII that Hans Holbein visited England and remained there till his death. With these few exceptions we have no record of English artists of importance previous to the reign of Charles I, and the masters of this period were almost exclusively portrait painters. Before the time of Charles I all important works were intrusted to foreigners.

In the sixteenth century we meet with what may be called a school of painting in Spain. The prevalence of Mohammedanism was antagonistic to the development of pictorial art, and when the Moors were finally overthrown, the Roman Catholic religion brought with it the paralyzing influence of the Inquisition, beneath which it was impossible for art to progress. The first formation of the Spanish school was due to the settlement of Flemish artists in Spain, but in its perfected character it showed considerable affinity

to Italian art, as represented more particularly by the Venetian masters and the Neapolitan naturalists. Italian taste continued paramount till it was rendered subordinate in the seventeenth century by the national characteristics exhibited in the works of Zurbaran, Velasquez, and Murillo.

Spanish art is stamped with a gloomy asceticism peculiarly its own, from which even the best works of its greatest masters are not free. The painting of Spain was essentially naturalistic; we never meet with the idealism so prevalent in Italy. Faithful representations of Spanish life in the cloister, the palace, or the street are plentiful, and in this peculiarity we notice a resemblance to the English school. The great painters of Spain in the sixteenth century are Antonio Del Rincon (1446-1500), who had considerable power of design. Luis de Vargas (1502-1568), whose works are remarkable for brilliancy of coloring, character, and expression, but are wanting in harmony of tone. Greater than either of these was Luis De Morales (1510-1586), surnamed the Divine on account of the ascetic sanctity of his works; they are remarkable for a warmth of coloring unusual to Spanish artists. Vicente Joanes (1523-1579), who was an ascetic in style, like Morales, studied in Italy and has been called the "Spanish Raphael"; his pictures are of sacred subjects, and though bearing witness to their artist's assimilation of Italian elements of design, retain the Spanish character of gloomy and impassioned fervor.

Pablo de Cespedes (1538-1608) was one of the best early Spanish masters. He excelled in coloring, chiaro-oscuro, invention, and composition.

The seventeenth century produced the greatest masters of the Spanish school. Juan de las Roëlas (1558-1625) was not inferior to Cespedes in coloring, and perhaps surpassed him in design and character. "No master," says Mr. Ford, "ever painted the sleek grimalkin Jesuit like Roëlas." He was one of the earliest masters of the school of Seville, which afterward became so famous. Francisco de Ribalta (1551-1628) was a correct and forcible designer. Francisco Pacheco (1571-1654) founded the school in which Alonzo Cano and Velasquez were pupils. Alonzo Cano (1601-1669) was a painter of high original genius, whose works are chiefly distinguished for force of design, rich and vigorous coloring, and bold execution. Velasquez (1599-1660) takes rank as a portrait painter with Titian and Vandyck. His style is strictly naturalistic, and his power of imitation has seldom been rivalled. Whilst studying the works of all of the great masters of Italy, he yet retained his own individuality, stamping everything he touched with the dignity of purpose and strength of will by which he was distinguished. Mr. Stirling, in his valuable life of the great painter, says, "He discovered that Nature herself is the artist's great teacher, and industry his surest guide to perfection." His compositions give us a vivid insight into the national life of his day; the figures are studied from life, and the most humble scenes, whilst faithfully rendered, are never vulgarly treated.

Francisco de Zurbaran (1598-1662) was one of the first Spanish painters in whom we recognize an independent and national style. His heads are powerful and lifelike, admirably expressive of religious fervor, mental agony, or triumphant faith. The coloring and chiaro-oscuro are remarkable for depth and

breadth, but his designs of large groups want harmony, and he made no attempt to idealize or tone down the expression of suffering. The individualism and realism of the Spanish school are well represented by him.

Bartholomé Estéban Murillo (1618-1682) may be taken as the chief representative of the Spanish school of religious painting. His works are remarkable for softness and brilliancy of coloring, devotional feeling, and picturesque delineation of national character.

Murillo and Valasquez are the greatest Spanish painters.

On the death of the great masters of the Renaissance period, we notice a decline in painting in Italy, marked by the same peculiarities as that which succeeded the Golden Age of sculpture, technical dexterity ranking higher than artistic genius. To check this deteriorating tendency, it seemed necessary to introduce and establish rules founded upon the practice of the generally recognized greatest masters. The school of the Carracci, founded by Ludovico Carracci at Bologna, was the first to professedly adopt this principle. He was supported by his cousins, Agostino and Annibale. A curious sonnet by the former defines the general aim of the school: "Let him who wishes to be a good painter acquire the design of Rome, Venetian shade and action, the terrible manner of Michelangelo, Titian's truth to nature, the sovereign purity of Correggio's style, and the just symmetry of a Raphael; the decorum and well-grounded knowledge of Tibaldi, the invention of the learned Prematiccis, and a little of Parmigiano's grace; but without so much study and toil, he need only apply himself to imitate the works which our Niccolino has left us." This system of selecting various excellences obtained for the academy the title of Eclectic School, but the study of nature was not excluded. No subsequent academy has been so successful as that of the Carracci. Ludovico Carracci (1555-1619) appears to have been rather a teacher than an original painter; Agostino (1558-1602) is better known as an engraver and teacher, than as a painter; Annibale (1560-1609) surpassed both Ludovico and Agostino, and had he not been fettered by his mistaken desire to combine naturalism with an imitation of the great masters, he would probably have worked out an original and superior style. As it is, his works have something of Correggio, Paul Veronese, Michelangelo, and Raphael about them, without any distinctive character of their own. Among the numerous pupils of the Carracci are Domenico Zampieri, surnamed Domenichino (1581-1641), a successful imitator of Raphael and of Agostino Carracci; Guido Reni (1575-1642), who possessed considerable feeling for beauty of form, and great skill in execution, especially in coloring; and Barbieri (Guercins) (1590-1666), who excelled in brilliancy of coloring, depth of chiaro-oscuro, and power of expression.

There was great opposition to this school by those who adhered entirely to the study of nature, particularly at Naples, where they determined to have recourse to poison and the dagger should any academic painter establish himself there. The most powerful painter of this school — called the Naturalistic School — was Caravaggio (1569-1609), whose works have some affinity with those of Michelangelo, and give proof of great original power and feeling

Ribera, a Spaniard, who ranks with Caravaggio; and Salvator Rosa (1615-1673), a naturalistic master, who painted landscapes, historical subjects, and *genre* pictures, and also excelled in portraits. The style of these naturalists, from their unselected imitation of nature, reflects all the savage passion and dark criminality of their natures: the violent contrasts of light and shade are perfectly congenial to the horrible and ghastly scenes of suffering, murder, and robbery which they delighted to represent. This school, as well as that of the Carracci, exerted a powerful influence over the whole of Europe. The similarity in the temperament of the Spaniards and Neapolitans will readily explain why this style prevailed so extensively in Spain.

At the close of the seventeenth century, Pietro Berettini da Cortona (1596-1669), in spite of great original talent, exercised a most pernicious influence on Italian art by the introduction in his works of startling effects of color and *chiaro-oscuro*, which were studied and imitated, thus sealing the fate of Italian painting, which has never rallied from the mannerism into which it sank at the beginning of the eighteenth century. As a contemporary of the Carracci in France, we have Nicolas Poussin (1594-1665), the founder of what is called the heroic style of landscape painting. He excelled in the treatment of landscapes and classic subjects, and exerted a most important influence upon the arts of his country, although it was not immediately apparent in the decorative, theatrical age of Louis XIV, or the heartless times of Louis XV. He lived almost entirely at Rome. Besides the excellence of his composition, Poussin's design is very correct, though monotonous from a too uniform imitation of the antique. His attitudes are frequently theatrical. His coloring has generally a brick-like tone, arising from the darkened red priming showing through, and his red and blue draperies have a spotty effect. In landscape, Poussin holds a distinguished place. His classical compositions have, however, little in common with contemporary English landscape art, although he was one of the earliest great landscape painters.

His pupil Gasper Dughet (1630-1675), the great landscape painter, is generally known as Gaspar Poussin. He lived and painted at Rome. In his earlier works he adopted the severe forms of his brother-in-law, but a more genial feeling pervaded many of his later landscapes; he paid especial attention to what we may call meteorological rather than aerial effects.

Claude Lorraine (1600-1682), though inferior in power to Poussin, is more generally admired on account of the soft brightness of his pleasing landscapes, which attract the most superficial lover of beautiful scenery. His effects of sunlight, his general treatment of aerial perspective, and his rendering of calm water, are still unrivalled, except perhaps by Turner, with whom he is considered to have some affinity; but he never rose to the ideal or produced anything of really vital power.

Eustache Lesueur (1617-1655) is the greatest master who can be strictly claimed as French; yet, though he never went to Rome, he is one of the most Italian of French painters. He approached Raphael perhaps more nearly than any of his Italian imitators in the character of his heads, the style of his compositions, and the arrangement of his draperies.

Charles le Brun (1619-1690) might be called a characteristic exponent of the spirit of his times. War and tumult are the elements of his style. He studied at Rome under Poussin, and made the Carracci his models; he showed great vigor, but little real taste and less refinement of sentiment in his works.

In the seventeenth century, in England, we find Nicholas Hillard (1574-1619) Isaac Oliver (1556-1617), and Samuel Cooper (1609-1672), distinguished miniature painters; and contemporary with the latter are George Jameson (1586-1644), called the Scottish Vandyke, who was a fellow-pupil with Vandyke in the school of Rubens; Robert Walker (1600-1660) and William Dobson (1616-1664), who were both successful portrait painters, but little inferior to Vandyke.

During the seventeenth century some of the most eminent painters of Europe visited England, among whom were Rubens, Vandyke, and a great many others.

In the beginning of the seventeenth century we notice a revival of painting in the North, characterized by a return to the realism of the Van Eycks, combined with something of Venetian breadth, great harmony of coloring, and general balance of tone. The first great master of this new development was Peter Paul Rubens (1577-1640), who brought about a complete reform in Flemish painting. Rubens' great distinction is his extraordinary mastery of his materials. He excelled in coloring, brilliant execution, fertility of imagination, and vitality of expression; his figures are often coarse and lack spiritual beauty, especially in his sacred subjects. He spent some time in Italy, where he became, not the pupil, but the successful rival of Paul Veronese and Tintoretto. What has been said of Michelangelo in form, may be said of Rubens in color. As the one came to Nature and moulded her to his generic form, the other came to Nature and tinged her with his color, — the color of gay magnificence. The earlier works of Rubens are the best; his later works are more mannered. His larger works are remarkable for the boldness with which pure colors are placed side by side, and left to be blended by distance. Of his numerous scholars, Anthony Vandyke (1599-1641) is the greatest. He is chiefly distinguished as a portrait painter, and in this branch is inferior to Titian only in color and solidity of effect: he excelled Rubens in spiritual beauty, in elevation of sentiment and refinement of execution. Besides his portraits, he executed many historical pictures, some of which are works of the highest merit. In individuality, in attitude, and in costume, he leaves nothing to be desired; in drawing and management of light and shade, he is equally excellent. None of Vandyke's pupils attained the high excellence or great reputation of their master.

Philippe de Champaigne, a successful landscape and portrait painter of this century, is claimed alike by the French and Flemish schools. His landscapes are characterized by poetic feeling, force of coloring, and tenderness of chiaro-oscuro, and his portraits by truth to nature, individuality of character, and general harmony of tone.

At the same time, in almost the same place, arose another school, different from the Flemish or from that of Rubens, and dependent upon the elabora-

tion of only a single element in art, — that of tone, or light and shade. The founder of this school was Paul Rembrandt (1608–1669), the most attractive and original of painters. Of all the schools of coloring, that of Rembrandt is the most studied, — the least apparently natural, though perfectly so. In everything but form, he is perhaps the most original and creative genius among painters. The striking effects of Rembrandt are obtained by concentration of light, contrasted with large masses of shadow, which are broken up with the utmost subtilty of graduated shade and reflected light. Tone, and the giving of roundness to individual objects, was understood by Da Vinci and Correggio, but the style of Rembrandt is made up of effects and contrasts created instantaneously, his color depending upon contrast, not on any positive degree of its own. This style required great knowledge and command over materials : the tone and harmony of Correggio, on the other hand, are the result of patient elaboration, and perfect command of the tools or instruments of art, which may be obtained with only a moderate knowledge of the laws and means of coloring. With Rembrandt, light and shade was color. He had many pupils and imitators.

Of the numerous *genre* painters of this century, David Teniers (1610–1694) holds the highest rank. His father is considered the founder of the great Belgian school of *genre* painting. He was not only the best delineator of his day of the manners and customs of his contemporaries in every rank, but the greatest *genre* painter of any period ; the characteristics of his style are force, harmonious balance of grouping, delicate execution of details, a spirited arrangement of figures, and a keen and irrepressible spirit of humor, breaking out at every turn. As great contemporaries of Teniers, we have Peter Breughel (1529–1569) and his two sons. Teniers had many scholars and imitators, none of whom attained the distinctive excellence of this great leader of *genre* painting. Landscape painting also received much attention in the North during this century. The impulse communicated generally to landscape painting originated in the Italian school of the Carracci, but is fully apparent also in the finely-composed and classical landscapes of Nicholas Poussin, the stormy and aërial effects of Gaspar Poussin, and in the serene beauty and sunshine of Claude Lorraine.

The end of the seventeenth and the whole of the eighteenth century were marked by a rapid decline in the art of painting, both in Belgium and Holland, and not until the present century do we find any definite or important revival. In Germany, in the eighteenth century, we find a tendency to copy French rather than Italian work.

At the beginning of the eighteenth century painting in France had greatly declined in power, and had become little more than a means of glorification of the favorites of the hour. From this degraded position it was rescued by the genius of Anthony Watteau (1684–1721), who stands at the head of the school of the eighteenth century, — which may be characterized as purely national, — and may be said to have influenced not only the style of all later French masters, but also that of the British school. Watteau excelled in technical execution, truth of character, and easy grace of design ; in general effect of color, he was a miniature Paul Veronese. He confined his practice to minor subjects, yet had

many imitators. The works of Boucher (1704-1770) show all the faults of the French school, without the beauty of finish, grace, and truth of those of Watteau; as mere pieces of decorative painting, his works are generally beautiful, but his forms and coloring are wholly factitious. His influence was corruptive. Greuze (1725-1805), despite enamelled surface and a certain taint of conventionality, is deservedly a favorite, in virtue of the simple homeliness of his themes and his careful study of nature. He is well known for his *genre* pictures, which are often engraved, and for his beautiful female heads. Another artist of this school was François Lemoine (1688-1737).

At the close of the eighteenth century and beginning of the nineteenth, an attempt to revive the so-called classic manner of painting in France, was made by David and his followers.

On the death of Velasquez and Murillo, although they formed many pupils, painting in Spain sensibly declined. Throughout the eighteenth century not a single artist of note arose in Spain.

From long-continued neglect of using any means for fostering native talent, art in England had sunk about this time to apparently the lowest point to which it can descend in a civilized nation; but with the Georges a new era dawned: at least foreign immigration was checked by finding that the market was forestalled by Englishmen, with whom they could not compete.

In the eighteenth century we meet with Jonathan Richardson (1665-1745), one of the best informed and soundest of critics in the whole province of art. The manner which prevailed in England at this time was a sort of third edition of Vandyke. Sir James Thornhill (1676-1734) was distinguished for his decorations, which deserve recognition as leading more or less directly to the great movement headed by Hogarth, which raised native art to so high a position in the eighteenth century. William Hogarth (1697-1764) is the first great name in the annals of British art. He divides with Reynolds the honor of having founded the English school of painting; he was in every respect a reformer, and was the first to break loose from the insipid imitation of second-rate Italian painting which prevailed in his day; he originated a purely national style, rescuing painting from its tame and lifeless attempts at high art, and employing it as a language to reform the manners of his time. In his best examples, he belongs to the highest *genre* painters.

Viewed merely as works of art, his paintings, though characterized by force if not correctness of drawing, and by marvellous dramatic and inventive power, may perhaps be justly charged with being wanting in sense of beauty and refinement and feeling for color; but as moral engines for bringing vividly before men the inevitable results of crime and wrong-doing, they are absolutely unrivalled. In technical execution and general manner they betray French influence, especially that of Watteau; in dramatic force and originality they are distinctively English. His works, aside from their extraordinary originality, are filled with wonderful satirical and humorous invention. "Hogarth," says Walpole, "had no model to follow and improve upon. He created his art. and used color instead of language. His place is between the Italians, whom we may consider as epic poets and tragedians, and the Flemish painters, whom we may rank as writers of farces and editors of burlesque nature.

His was the period of the revival of painting in England in every department of art, and the brightest names in the annals of English painting were his contemporaries,—Sir Joshua Reynolds, Gainsborough, Wilson, Copley, and West.

Sir Joshua Reynolds (1723-1792) was the first President of the Royal Academy, which was founded under the auspices of George III. He was one of the greatest English portrait painters. His works are characterized by simplicity; beauty, truth of coloring, easy grace of execution, and a singular originality of invention. He endeavored to unite the best methods of the Flemish and Venetian masters; but his practice usually inclined, like that of the English school generally, to the traditions of the former. In general force of effect he resembled Rembrandt, of whom he was a great admirer, and in breadth of *chiaro-oscuro* and coloring in his best works, he showed some affinity with Titian, Giorgione, and Velasquez; but in thoroughness of finish and correctness of drawing he was inferior to any of them. In merit, his portraits approach, if they do not equal, those of Vandyke; his fancy pictures are full of the deepest tenderness or the brightest spirit; and his historical and sacred subjects are often grand and always powerful. Thomas Gainsborough (1728-1788), the rival of Sir Joshua Reynolds in portraiture, and of Wilson in landscape, is a master of whom any school might be proud. Sir Joshua says of Gainsborough, "Whether he most excelled in portraits, landscape, or fancy pictures it is difficult to determine." His works are characterized by purity of feeling, solemn reverence for nature, and masterly treatment of *aërial perspective*; his portraits are remarkable for grace and delicacy and a peculiar lightness of touch, which has been much criticised, the effect being produced by an infinite number of slight lines, technically called *hatching*. In Gainsborough the sweet innocence of childhood, the tender beauty of maidenhood, and the intellectual grace of English gentlemen and gentlewomen, found their first English exponent.

Richard Wilson (1713-1782) began life as a portrait painter, but attained his greatest excellence in landscape painting. His compositions are grandly conceived, though sometimes inaccurately carried out; he caught the broad lineaments of nature, reproducing her grand outlines and massive effects with boldness, force, and skill in composition, but he failed to render the tender gradations of color and *chiaro-oscuro* which characterize her gentle moods, or to give the detail of landscape with faithfulness.

With Wilson may be mentioned, as contemporaries of Reynolds and Gainsborough, George Barrett (1728-1784) and Julius Ibbetson (1759-1817), both landscape painters. Contemporary with these men was a group of painters who endeavored to introduce an ideal style of historical painting in England, and deserve mention not so much for their success or talents, which were but moderate, as for the steadfastness with which they pursued their aim, in spite of the discouragement which they met with on every side. The most prominent of this group are Benj. West (1738-1820), James Barry (1741-1846), and John S. Copley (1739-1815).

At the close of the eighteenth century the art of water-color painting, properly so called, was first practised in England.

XXX.

CHARCOAL DRAWING.

IN the use of the lead pencil and crayons, and of water colors and sepia, as well as of India ink, both with the pen and with the brush, you have already had some experience. It is now proposed that you shall have a short course of lessons in the use of charcoal.

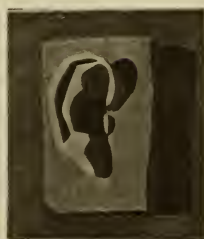
The properties of this material are sufficiently illustrated by the drawings hung upon the screen, comprising studies from life and from the cast, landscapes, drawings of flowers, and some elementary studies, such as vases, bunches of fruit, and these colossal ears. You perceive at once that this material is distinguished by great range of tone, the intensest black and the most delicate gray, hardly distinguishable from white, being equally at command; this quality, however, is also possessed by the crayon when combined with the stump. On the other hand, the sharp, fine, hard line which the crayon so easily produces can hardly be made with a bit of charcoal. But charcoal gives a broad tint of whatever depth, either graduated or quite even and flat, quicker than anything and better than anything, except perhaps a brush full of color, and in one respect it is unrivalled. Its effects are not only the easiest and quickest in the making, they are the easiest to remove: a strong breath will blow a drawing in charcoal almost entirely away. This would be a serious obstacle to its use were it not practicable, when a drawing is done, to fix it, as we say, by the use of a little shellac dissolved in alcohol, either soaking the back of the drawing or scattering this preparation in spray over its face. Meantime, the facility with which the charcoal can be removed is a signal advantage, as it permits of change and correction at every stage of the work, and encourages a much bolder procedure in its earlier and simpler stages than would otherwise be wise or safe. The reflected lights, for instance, do not need to be "left," but can be put in, or rather wiped out, whenever the work has reached the stage at which their consideration is in order.

For work, then, in which broad, flat shades are to be produced, and for that especially in which it is proposed to make essential changes after it is well under way, charcoal is peculiarly adapted; it is, that is to say, just the thing to use for a drawing in which you propose to begin by putting in the principal effects broadly and simply, leaving the details to be added at a later stage of the work.

Now, you will observe that each of the other materials enumerated has also a special kind of work for which it is best fitted and which is in common parlance almost identified with it. It is generally understood, for instance, that the use of the lead pencil or sepia implies sketches on a small scale; the crayon suggests full-size drawings from the cast or from the human figure, and India ink implies architectural or engineering work, with carefully graduated shades and shadows. In like manner, when we speak of charcoal drawing we generally understand the method of going to work which I have just now indicated as being that for which charcoal is especially fit, beginning, that is, with broad, flat shades, considering first the main features of the object to be represented, and omitting all details until, in the gradual advancement of the work, their introduction becomes necessary. This method of work can of course also be followed, in a measure, with any other material, though somewhat less conveniently, since with almost every other material except oil paints the "lights" have to be carefully kept from the outset; the employment of this method, however, wherever and so far as the material used will permit, presents some advantages which it is worth the while to point out. I will accordingly say no more about charcoal, leaving it to commend itself to your approbation by the brilliancy of its effects and the ease with which they are produced, and will devote the rest of the time set apart for this discourse to the consideration of the method of drawing with which charcoal is identified, — that of beginning a work with broad, flat lights and shades, leaving the half shades and reflected lights and all other means of expressing the details of form until its later stages.

I. In the first place, it is to be observed that in omitting the details in the representation of any surface and expressing its general tone, that is to say, the average amount of illumination it receives, by a broad, flat tint, we necessarily make it appear as a plane surface. An object of complicated form, then, such as this sitting figure, this bunch of fruit and leaves, or this mask of Jupiter, appears to be bounded by plane surfaces, and if a strict consistency is preserved, as is done in some of them, these planes, which correspond to the main divisions of the surface, intersect at their edges in straight lines, corresponding to the main ridges which determine its form. The outline also, which in the object is a succession of curved lines rounding into each other, becomes a succession of straight lines meeting in angles more or less obtuse. At this stage, in fact, the drawing, as you see, resembles not so much the finished statue from which it is made as one of its earlier stages, when the sculptor had got so far as to determine the main movement of his figure and fix the relation of its principal surfaces, but had not begun to render the more delicate characteristics of its form. This first stage of the drawing is indeed called blocking out, as if the draughtsman, too, were rough-hewing his block into a polygonal, or rather polyedral, figure.

You will observe in the examples before you, although they all illustrate this general method, a considerable difference of procedure. In these vases, for instance, the actual contour of the object is carefully drawn, with all its delicacy of curve, while the body of the vase is put in quite flat, as if it were



a plane surface. The study and rendering of the outline has outstripped that of the shading. In this figure of a monk, however, one of a set of famous sculptures from the tombs of the Dukes of Burgundy at Dijon, you see that the treatment is rather more consistent, the shading and outline showing about the same amount of elaboration. This seems theoretically preferable, but the other is thought by some teachers to have practical advantages. Another difference is that in some of the examples, as in this head of Jupiter, all the principal divisions of the face, all the principal planes, that is, are indicated by as many different tints or shades. This tiger's head, on the other hand, like the vase we were just looking at, is drawn in only two tints, all the light side being left white, or the color of the paper, and all the dark side being covered with a single flat shade. These, however, we may regard rather as showing the successive steps in the process of blocking-out than as two different ways of going to work, the first step being to distinguish the light part from the dark part, and the next to break up each into the various planes of which it consists. Wherever the light is at all concentrated, this line of demarcation between the light side and the dark side — the dividing line of light and shade, as we call it — is generally sufficiently distinct to permit of its being pretty accurately defined, — accurately enough, at any rate, for the temporary and provisional purpose it has to serve. But sometimes, when the light is not very strong, three tints instead of two, as in the case of this monk from Amiens, sitting and reading his book, are as few as one can comfortably get along with, even at the beginning.

II. The object being thus blocked out, its outlines approximately determined, its principal planes discriminated and indicated, each in its own shape and size, and, what is equally important, each of its own value, meaning by this its proper degree of light or shade, — the first stages of the process being thus accomplished, we next follow in each of the subdivisions thus established a similar procedure. Each plane surface, with its bounding lines, is re-examined and broken up into minor planes corresponding to the lesser divisions of the form, each differing in value from its neighbors, or the eye could not distinguish it from them, but only slightly differing and not so as to disturb the general tone already established; and as the subdivisions multiply and the planes differ less and less in position, the contrasted tints, of course, differ less and less, the angles at the ridges becoming at last so obtuse as not to be noticed. The lines in like manner, both those defining the contour and those which mark the chief ridges of the surface, are refined and corrected, but not so as to lose their subordination to the main movement already established. And so this process goes on, the work, as it advances, embodying the results of a more exact observation, a more exhaustive analysis, a more minute acquaintance with the form, as it proceeds from generals to particulars, from the representation of the principal characteristics by broad masses of light and shade and vigorous though only approximate outlines, to the delineation of the smallest details of surface or contour which the purpose of the work makes desirable or the skill of the draughtsman makes practicable. The development of the work proceeds, in

fact, as the philosophers would say, by successive differentiation, passing at each stage of its progress from a more homogeneous condition to one of greater heterogeneity.

All this can, of course, happen only in cases where the surface to be represented is really a broken surface. In a continuous surface, like that of these round vases, for instance, we can hardly go farther in this process than the first step, the discrimination of the light side from the dark side. There is no complexity of form to investigate; we cannot indicate subdivisions that do not exist. Unless, then, there are accidental lights or shadows to be recognized, the only thing that remains to be done is to graduate the tints, to express the roundness. Even a flat surface, a geometrical plane, is generally lighter in tone in one part than in another, or seems to be so, so that even here it may be best to graduate the tone. Whether in any given case it is better to do this or to leave the plane and curved surfaces quite flat in the drawing depends partly on the degree of finish aimed at and partly upon their extent. In the case of these vases, as you see, it is done with care; but in the human face, for instance, it is often possible to reduce it to elementary surfaces so small that they may be left quite flat.

There is danger, too, both in the outline and in the shading, if this idea of finishing up by rounding the forms is admitted, that it will be resorted to prematurely, and a meretricious smoothness of surface take the place of a thorough delineation of form. There is danger that the final analysis will be dispensed with. I think you will understand exactly what I mean if you recall to mind some drawings that you have seen, especially stippled drawings; for the process of stippling, as you have doubtless experienced, offers great temptations to the student to substitute hand work for head work, careful workmanship for careful observation. It is better for a piece of work to go incomplete than to pretend to be more highly finished than it really is.

It is to be observed that drawings made in this way, although even in their most advanced stage avowedly unfinished and far short of an ideal perfection, are yet always, in a certain sense, complete, even in their earliest condition. Imperfect as are most of the drawings before you (I do not now speak of the lack of skill they evince, — that I do not apologize for: they are the works of beginners, made during their first week, — but of their imperfect state of development, most of them not having been carried beyond the very first stage of the process), primitive and rude as is the means employed in their production, they are still, as I think you will agree, in a certain sense sufficient. They tell their own story, they give the main action and character of the object they represent, its relation to its surroundings, its pictorial quality in light and shade; its form, its total effect, its relation to the background, its position in space are given, — not, indeed, exhaustively, but, as I have said, completely, as far as they go. The detail, both of the outline and of the modelling, is omitted, but they convey a chief part of the impression you receive from the presence of the object itself, — pretty much everything, in fact, that you get at the first glance. To get the

rest is worth all the labor and skill it takes to carry the drawing from this early stage to its last practicable perfection. But even as it stands, it is not unsatisfactory.

And also, as I have said, not only are the least advanced works always, in this sense, complete, but the most advanced are never, in any proper sense, finished. When this process of development has gone as far as it is thought best, for any reason, to carry it, — and it is never worth while to carry it into the delineation of details that cannot be recognized at the distance from which the drawing is to be viewed, — then the process stops, and the drawing, still unfinished but ever complete, is done. One sometimes, to be sure, witnesses the results of the burnishing process that have I spoken of, by which the drawing is gone over and smoothed up by way of finishing off. Some of the drawings which you remember to have lately seen at the rooms of the Art Club, made in accordance with the method I am describing, seemed to have been subjected to this sort of polishing; but it seems to me that this is contrary to the spirit of the method, as it is certainly injurious to the vigor and character of the result. This was indeed sufficiently demonstrated by a comparison of these drawings with others at their side, from the same admirable school, in which, on a close examination, the sharp edges and flat planes could be discerned even in the softest folds of the draperies.

The same may be said of the treatment of outlines. A real curve must be drawn with a sweep of the hand, the broken line first put in serving only as a rough guide; but when a line is very much broken, it is often safer and better, after resolving it into its elements, to leave it as it is, even at the risk of a little angularity, than to attempt further refinements of form. Of course it is well to improve the line, if you can. What I mean is, that very often you can't, and that it is better to let it remain a succession of straight lines than to substitute curved lines, which pretend to be more accurate but are not.

III. So much for the method of procedure, the *modus operandi*, which, although particularly suited to charcoal, is, as I have said, practicable in a degree with almost any material; but the main advantages of the method are independent of the material used, and consist in this, — that it is conducive to rapidity of work, to the accuracy and artistic quality of the result, and to the development of some of the highest qualities of the draughtsman. Let us consider these points in succession.

In the first place, it is obviously conducive to rapidity of execution; for a good share of the work is achieved at once by the simplest and most expeditious means, and whatever further elaboration the drawing receives finds the ground already prepared for it, the form already blocked out, so that a comparatively trifling labor is all that is needed to make the corrections required. That this rapidity and economy of time and patience is a good thing, that in these pursuits time and labor are worth saving, would hardly need to be insisted upon, but that it sometimes seems to be thought that, as practice makes perfect, the more time and labor one can spend on merely disciplinary work the better. Let me, in reply, cite the opinion of a

writer* who, in an atmosphere sometimes supposed to favor a mechanical and treadmill way of working, eagerly protests against this idea, urging that labor is serviceable as discipline only in proportion to the amount of thought put into it. "Educational drawing," he says, "should be looked upon as the putting on paper of knowledge of facts and form; every line should be an attempt to fix and record the result of intellectual effort and comprehension. Masterly drawing is the result of knowledge." "It is lamentable to see students taking months to acquire knowledge which, by another method, could be imparted in a week. '*Ars longa, vita brevis est*,' and that system is the best by which the student gains the greatest knowledge in the shortest time." And again, in a somewhat different connection, "Not only does rapidity enable more work to be done, but the multitude of works affords a larger experience."

In the second place, this method of going to work is conducive both to the accuracy and to the artistic quality of the result. It produces, that is to say, good drawings, drawings exhibiting both these indispensable characteristics. Their accuracy in all that concerns the main movement and essential characteristics of form, as shown by the distribution of the main masses of light and shade, is indeed secured at the outset by concentrating upon these points the workman's whole attention during the earlier stages of the work, abstracting it from all consideration of details. These details are often so conspicuous and so interesting that one can only prevent their engrossing his attention by rigidly and systematically refusing to see them until the main forms have been disposed of. And as each of these details, in turn, comes up for consideration, a substantial accuracy in the rendering of its character also is almost inevitable: the groundwork is already prepared, as we have seen, and there is but little chance of going astray either in the outline or in the modelling, where the range is thus limited, and where, within that range, there is so little to do.

But the most important thing, in a pictorial point of view, and at the same time the most difficult thing of all to observe and to render with fidelity, is not the shape of each different mass of light or shade, but its value, meaning thereby, as I have explained, its intensity of light or shade relatively to the surfaces about it and to the background against which they are all relieved. This varies, of course, according as a surface is more or less turned towards direct or reflected light, as it is intrinsically darker or lighter in hue, and as it is more or less obscured by the illuminated air interposed between it and the eye. The apparent value of any surface, the relative amount of light it sends to the eye depends, that is to say, on the degree of illumination it receives, on its power of absorbing or reflecting light, and on what we call aerial perspective or the modifying effect of the intervening atmosphere. The expression, then, of form, color, and distance depends mainly upon the accurate rendering of the relations of value; it is indeed almost the whole of drawing,—only the consummate master can render it well. But under the method we are

* See "Lectures and Lessons on Art," by F. W. Moody, Instructor in Decorative Art at the South Kensington Museum. London. 1873.

describing, it becomes comparatively easy to render, first, because the shape and tone of the tints is the chief and only point of interest, from which attention is never diverted by questions of detail; and secondly, because in all the successive stages of its development, from the first rough blocking out to the last touch which it is thought worth while to give, all parts of the work are advanced simultaneously, so that it is comparatively easy to judge whether their relations to each other are properly preserved. An accurate rendering of values is indeed almost impossible to secure except by working all over a drawing at once, developing the whole simultaneously, as a whole.

All that has just been said, and indeed everything that can be said of this method of looking at things, applies with special force to the study and representation of landscape. The omission of details is indeed here a necessity; and the most that can be done with any material is to indicate, by a careful study of the values of different objects, their form, color, and relative distance.

And this method of work is obviously favorable not only to rapidity and to the accuracy of the drawings produced, but to their artistic character. That they should be strong and vigorous, and that they should have a certain unity of purpose, would naturally follow from the amount of headwork put into them. The discriminating observation of the facts before him, the sharp analysis of their relations, the definite judgment what to do and what not to do, which this method forces upon the workman, would suffice to secure unity and vigor. But it is not these that I have in mind in speaking of artistic qualities. Accuracy does not make a drawing a work of art, nor even do unity and vigor of treatment. What makes a work of art is the purpose that gives it birth, the feeling that informs it, the artist's interest in what he represents. Now, this interest, this feeling, this purpose, exhibits itself in drawing, as in speech, by emphasis. The draughtsman — the artist, rather — accentuates the point he cares most about and which he wishes to urge, to force even, upon the attention and admiration of others, and slights, subordinates, omits every detail that is irrelevant to his purpose or which threatens to interfere with it. The more eager and in earnest he is, — the more artistic, that is, his work is, — the more is he disposed to attend first of all and chiefly to the main movement, the essential and characteristic features, the total effect, and to subordinate the accessories, openly omitting what is really accidental and irrelevant; the more disposed, that is, to follow just such a method as the one I have described, attending to the masses first and to the details afterwards.

This has in fact been the method of almost all schools from Raphael down. It is sometimes called the French method, because the French are at the present moment the most conspicuous in its use, and have indeed devised materials, such as charcoal and the stump, particularly adapted to it; but the method itself is as independent of nationality as it is of material. Artists have everywhere in every country adopted it. I do not mean that they have proceeded to make drawings exactly in this or that way, but that they have given their attention first to their main masses and main move-

ment, considering other things as secondary and letting them fall into place as they were wanted, and have worked on that idea. So long as one does this, so long as he gives his masses the first place in his mind, it is a mere matter of convenience whether he does his work one way or another. For beginners it is essential to develop their work step by step in the order of their thought; but a master may of course work as he likes, and, if he can, finish up as he goes along, inch by inch, as Stuart is said to have done, for it is the course of thought, not the course of the work, that is the important thing, — the habit of mind, not the mechanical process. It is not because this method involves a more efficient manipulation that it is approved, but because it involves a more intelligent and efficient attitude of the mind. To attend first to essentials and to let unessentials wait or go by altogether, involves a larger way of looking at things, a more comprehensive observation, and fosters a habit of regarding things in the mass and in their entirety. If this is done, it is a mere matter of convenience, a question of personal skill on the part of the artist, whether he puts down all his thoughts or not.

Finally, this attitude of mind and the method of work to which it gives shape, and which in turn tends to render it habitual, is obviously conducive to the development of some of the best qualities of the draughtsman. To learn to see things as they really are, not in their accidents and their details but in their essentials, and even in temporary and accidental effects to seize the essential element of the effect, is just what the artist of every kind most needs to learn. It is this discriminating perception that distinguishes the real artist, not a mechanical facility of hand or a mechanical accuracy of eye. The child who, when first shown a picture by Titian, exclaimed, "Why, he sees things just as I do!" showed her friends that she was not only a prodigy of talent, which they knew already, but that she had the artistic perception which is the soul of a painter. This power, although, like every other, existing in different persons in different degrees, may, like every other, be developed and strengthened by exercise. It is not the least of the claims of the method of drawing under consideration that it not only exercises the powers of attention and analysis and judgment, but that it incites the artist to let his mind float freely over the whole surface of things, as Mr. Arnold might say, and, neglecting the obvious and obtrusive details that are so likely to entrap the attention, to enter into their real spirit and character.

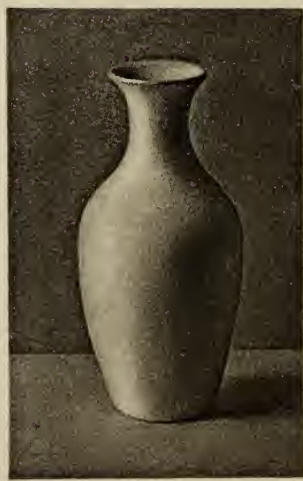
IV. You may be disposed, perhaps, to think that all this may be true enough, and important for painters, but that it is not important for you; that these considerations relate to high art, not to the more modest paths of industrial or decorative art which you and your pupils are to follow; that it will be time enough to think of these things when some special talents are manifested by somebody that seem to demand a higher training. Now, admitting that there is a certain kind of drawing necessary to be done which is absolutely mechanical, so that an animated machine would do it just as well as a man, still I say that even for this kind of draughtsmanship it is a good thing for the draughtsman to have the training this method gives, and this for two

reasons: in the first place, that kind of work, since accuracy is its only merit, needs every aid to accuracy that any method can afford, and we have seen that this method has pretensions on this score that are not to be overlooked. It is found, indeed, that for antiquarian and scientific purposes, where abject literalness is the main thing to be secured, draughtsmen trained in these methods are the best; they are most apt at seizing the individuality of form or character which makes it desirable to draw such objects at all. But in the second place, most work of this sort is done nowadays by photography, and the draughtsman is called in to do what the photograph cannot do, that is, to exercise judgment and taste, and the higher his quality the better he will do even the inferior work, and the more rapidly he will be promoted to work that is superior. In fact, the rudiments of a superior culture, especially in one's own line of life, never do any one any harm.

But this is not the sort of work which this school is ultimately intended to foster; it is industrial drawing, properly so called, that is to say, the application of design to manufactures, or decorative art. If you suppose that this is a simple, easy, or subordinate branch of art, or that mere draughtsmanship is of any use in it, you are very much mistaken. Both in theory and in practice it requires the exercise of the highest faculties and involves in its degree the highest qualities of art; it is knowledge of form and skill in composition that are necessary in industrial art, not a mechanical imitation of nature. And here I may again quote the writer of whom I have already spoken. After pointing out that naturalistic art is necessarily imitative, and that decorative art and ideal art are in principle the same, "On the one hand," he says, "the representation of facts or subject, is the purpose, — on the other, to cover a given space beautifully; and the union of these two is the finest art, for a space is not the less beautifully filled because a story is at the same time told in it. The spandrils of Michelangelo are examples of both qualities. It is not by accident that decorative art and ideal art have always flourished together; for the same technical knowledge is necessary to both. The greatest artists have been the greatest ornamentalists." And I may add that decoration should be, in its way, just what Veronese or Titian would have made it. This may seem to you discouraging doctrine, since we cannot expect to find such men, and if we could they would not spend their lives designing furniture and calicoes. But what distinguishes these men is their greatness; they differ from more common folks not in kind but in degree: and men of the same quality, not adequately endowed to make painters, but capable of doing less difficult work as well as it can be done, may turn up any day. They do. Now, in order to fill beautifully a given space, the space must be regarded as a whole; the main distribution of masses of color and the main movement of the lines is the main thing. This is what we mean by composition. It follows at once that the way of working we have been considering and the way of looking at things and thinking of them on which it is based and which in turn it tends to foster, are just those which a school of industrial art should employ. And this is, I may say, eminently the case in the study and practice of architectural design.

It is said, moreover, and it is a saying too significant not to be repeated, that the way of regarding things which a draughtsman thus acquires soon pervades every department of his thought, until it becomes a trait of his whole intellectual character; that, by an easy analogy he comes to look at everything in life largely and simply, in its most important and significant aspect, taking no trouble about trifles and details which have really no interest, and not being troubled by them; so that the study of drawing, thus pursued, not only opens a new sense in art, but makes the whole of life seem simpler, nobler, and more serene. If this is so, we may here find an answer, and believe it to be one of the true answers to the question so often asked, — what good art or the pursuit of art really does. That it makes life pleasanter seems to many, both of those who regard it from within and of those who look on from without, hardly an adequate account of it, hardly a sufficient exposition of its function in the organization of society. But if, when rightly pursued, it gives happiness and dignity to life, by helping men to a clearer insight into the real nature of things, one may name it, without misgiving, in the same breath with literature, science, and religion.

The question might arise, and it is one which can hardly fail to arise in your own minds, whether this way of going to work is suited to beginners, and whether this way of looking at things is reasonably to be expected of children; the question, that is, naturally arises whether this method of work is a useful one for a teacher of drawing to take up. It may be admitted, I think, without hesitation, that, considering the intellectual character of the work it exacts and the continuous and concentrated attention it requires, it would hardly be expected that very young children should find it interesting or profitable. This is a practical question, in regard to which I can only say that in the few cases in which I have known the experiment to be tried it has succeeded. But if the experiments had failed, it would have furnished only another proof that children and grown persons often need different methods of instruction. For that this way of drawing is a capital introduction to the subject for all persons old enough to entertain the ideas on which it is based has been abundantly proved by experiment. Besides its obvious advantages in occupying and stimulating the mind, so that a drawing becomes not so much a piece of taskwork to be done as a lesson to be studied and understood, the peculiarity just now pointed out, that even in its must unfinished state work done in this way is nevertheless significant, and in a sense complete, offers the teacher a great advantage. He is able to take a drawing away from a pupil as soon as he has done all he knows how to do, without discouraging him or making him feel that all his previous labor is thrown away because he is not allowed to go on and finish it. The student may thus be kept at work beginning one drawing after another, of different subjects, until he has learned how to begin, how to seize the main movement in a few lines, — in a word, how to sketch. And this is in itself a lesson of great value. It is something to learn that, as in the case of this sarcophagus, nothing is too difficult to attack if you go simply enough about it. When one has learned to put in his main hues with accuracy, he may be allowed to carry his work to a second stage. This saves the student from the utter



loss of time and labor which comes from carefully elaborating a work fundamentally wrong at the start ; moreover, it affords a solution of a most perplexing question, — the question whether to begin teaching with outline or with shading. If outline is chosen, the work is almost inevitably not only uninteresting, but inaccurate : until one has some experience in shading he hardly learns what accuracy of line means or feels its necessity ; if, on the other hand, shading is taken up, each drawing takes so long to do that the drawing of outlines is hardly practised at all. But by taking different subjects in rapid succession and at first carrying them through only the first stages of the process, as was the case with most of the drawings on the screen before you, both kinds of work are kept constantly in hand ; one takes just about as much time as the other ; and, what is more important than all, the habit is formed of putting in the line with an eye to the shading, and the shading with an eye to the outline, and both in subordination to the general effect and ultimate result.

But a student should not be allowed to do more than two or three drawings at a time in this imperfect way, lest he come to believe that the rough indication and suggestion of form is really sufficient. Every third or fourth drawing should be carried as far as the student can possibly carry it. He thus not only learns that the first step is not everything, but finds out what points it is really essential to give at the start in order ultimately to succeed.

V. These, then, are the advantages claimed for the system of drawing which you are about to take up, and these are the considerations which justify its introduction into your course of study. But in thus urging its claims upon your respect, it is no more than fair and just to point out that, admirable and comprehensive as it is, it still chiefly regards one side of the subject, and that an exclusive and extreme application of its principles may lead to a certain narrowness and to the development of the faults which it is not specially designed to counteract. Everything, however good, has what the French call *les défauts de ses qualités*, the faults which belong to its merits. In any work the things that are considered first and chief must naturally receive most thought and attention ; the things that come last, less. Now, inasmuch as all objects appear to the eye as masses of color, the line that bounds them having no real existence, but being simply the limit where one color stops and another begins, it might be claimed for a system of drawing which gives chief attention to these masses, leaving the outline to take care of itself, that in addition to what has already been said in its favor it was the most natural way of working, producing results which most resemble in effect the effect of the objects themselves. And it is true that nothing can, in effect, be more unlike the real aspect of things than the results of a contrary way of going to work, in which the outlines, which have no substantial existence, are the only things represented, and the surfaces, which are really the only things to be seen, are left blank. A piece of white paper with black lines drawn over it is certainly as different, in its total effect, from a bunch of flowers or a group of men as one visual object can be from another. Nevertheless, these bounding lines, unreal though they are, and without breadth or thickness, first catch the eye and make the most vigorous and lasting impression upon the memory. It is

shape here that we chiefly attend to. An outline drawing, accordingly, absolutely unlike as it is, in general effect, to the object it represents, and consisting as it does in lines which have no counterpart in nature, gives, not indeed an exhaustive representation, but yet in a sense a complete one. It tells the chief part of what is to be told. The color and the modelling are hardly missed; if made with skill and care, indeed, it suffices to indicate much of the movement of the surface within and to express a large part of the life and character, the vigor of movement and delicacy of form that it is possible by any means to convey. It is, indeed, the chief means of conveying them; it is in the line that expression chiefly resides. Let me read you what Blake, himself a master of line, says of it:—

“The great and golden rule of art, as well as of life, is this: That the more distinct, sharp, and wiry the bounding line, the more perfect the work of art; and the less keen and sharp, the greater is the evidence of weak imitation, plagiarism, and bungling. Great inventors in all ages knew this: Protopogenes and Apelles knew each other by this line. Raphael, Michelangelo, and Albert Dürer are known by this and this alone. The want of this determinate and bounding form evidences the want of idea in the artist’s mind and the pretence of the plagiary in all its branches.”

Whether, then, we begin thus with the lines, or whether, as just now, in our charcoal-work, with the masses of light and shade, it is, you see, possible to put so much care and thought into our beginnings as to make what remains to do, in either case, seem quite secondary in importance. And this being so, it could hardly fail to come about that people should differ as to which is really the main thing, some maintaining that accuracy and delicacy of line is everything, that truth of form and of expression resides in the precise definition and delineation both of the main features and of the parts, and holding that, if these essential truths are maintained, other things, such as the modelling and the “values,” may in due time easily be added. In short, since the lines give two dimensions and the modelling only adds the third, it is obvious that the first is twice as important as the second. Moreover, it is more reasonable to fix the outline and then model the form indicated than to attend to the surfaces first, and determine their extent afterwards; and if this involves, in a measure, the study of particulars first and of general effects afterwards, it is plain that if you get every part right the whole cannot be wrong, and that a knowledge of the parts is a necessary preliminary to any proper comprehension of the whole.

This aspect of the subject is, you see, different enough from that which I was just now exhibiting to you. The point of view is different, and the system of procedure it implies differs accordingly. One system regards the surfaces, the other the lines that limit them. One might say, roughly, for distinction’s sake, that the first is the painter’s way of looking at things, the other the draughtsman’s. I should then have to recall what I was saying a moment ago, and say, instead, that the representation of values was almost the whole of painting, and that the tracing of lines constituted almost the whole of drawing. But the common usages of language hardly warrant this

form of statement, though I think it will suffice to convey to you the idea it is meant to express. The word "drawing" is generally used to signify whatever is done, whether by outline or by light and shade, to exhibit form, and "painting" to signify the representation of color. In this sense, the values belong to painting or to drawing according as they indicate color or form.

Each of these two systems, of course, recognizes the importance of the considerations which the other system puts forward, but it considers them of secondary importance. Both systems propose ultimately to cover the whole ground, both contemplating the same ultimate perfection and fulness of achievement. But however generous the intention, you can easily understand that each is, in practice, likely to give an undue, if not an exclusive prominence to its own side of the subject; and I think you will be disposed to agree with me that the plan is a wise one which is pursued in your own case, of taking up both systems simultaneously, not waiting for either in its complete development to do the work of the other, but letting exercises in line accompany the exercises in shading, each method supplementing the other's natural deficiencies. In schools, also, in which the study of values has been made the chief thing, it has been found well, in practice, to introduce special exercises in line, so that the student may not only acquire a certain dexterity of hand and eye, the importance of which, in all branches of industrial art, can hardly be overrated, but may be trained to observe and appreciate that refinement of form and delicacy of expression which line alone can give.

But however profitable it may be thus in practice to combine these two methods of work, however it may contribute to a large and generous view of the whole subject to contemplate it in both these aspects, the considerations I have urged in behalf of the way of thinking and the way of working I have endeavored to explain to you seem to me still to give it the first place in our regard. Without further enlarging upon them, or delaying you to point out the practical dangers of the opposite method, the defects that go along with its merits, I will ask your attention to a distinction which seems to me fairly to characterize these two systems, and to go far to justify this preference. It seems to me that the way of going to work by a careful delineation of form, working up from particulars to the whole, is natural and proper for the copyist, for the draughtsman whose aim is the exact reproduction of what is before him, — that it is the method, in short, of imitative art; while the other way, beginning with the general idea, and proceeding gradually to the details, is the way a designer goes to work, — that it is the method of ideal art. These different ways of thinking and working probably spring, at bottom, from fundamentally different views of the relation of man to nature and of the relation of both to art, — indeed, of the nature and purpose of art itself.

Without going into the general question, however, it suffices for our present purpose to observe that in the industrial arts, the advancement of which is the purpose of this institution, the draughtsman is not a copyist or imitator, but a designer, and that the methods of work natural and proper in the practice of original design are the proper methods for us and our pupils. In

the practice of design, at least, the study of the masses must precede that of the details; the general movement must be determined before the special forms are made out; things must be sketched before they can be drawn. And this view is confirmed and illustrated by what happens in the analogous literary process, where a rough sketch is prepared before the more finished work is attempted. A passage in Mr. Mill's autobiography is here so pertinent that I will read it to you: "I have found," he says, "that the patience necessary for the careful elaboration of the details of composition and expression costs much less effort after the entire subject has been once gone through, and the substance of all that I find to say has in some manner, however imperfect, been got upon paper. The only thing that I am careful in the first draft to make as perfect as I am able is the arrangement. If that is bad, the whole thread on which the ideas string themselves becomes twisted, . . . and a first draft with this original vice is next to useless as a foundation for the final treatment."

This passage, without the change of a word, exactly applies to artistic composition. The intellectual process in all composition is indeed the same. Now, the method of drawing which makes this process familiar, which fosters this mental habit, is the one most to our purpose; and that, it seems to me, is the one which forms the subject of this discourse.

VI. I have spoken of the study of line and of details as forming one system, and of the study of surfaces and of the masses of light and shade as forming another, because, in fact and in the nature of things, these generally go together. The study of line naturally tends to exactness and a minute precision, directing attention to the accurate representation of parts; the study of surfaces naturally brings up their relations of light and shade and a consideration of the general effect: but this association, although a natural, is not a necessary one, and a chief part of the benefit to be derived from the studies you are now to begin will be missed if you do not learn, even in your outline work, to proceed from generals to particulars, first determining the general movement of the forms, and then proceeding to put in the details in subordination to that general movement, making the line at last express everything that outline can of grace and vigor. Everything that I have said of the advantage of proceeding from generals to particulars applies just as much to the treatment of lines as to that of surfaces.

And on the other hand, the study of surface and of light and shade, although it naturally invites a larger and broader treatment, does not necessarily involve it, as the experience of almost all drawing schools, our own included, abundantly shows. In the shading, as in the outline, a premature effort to obtain neatness and a mechanical precision leads to poor and paltry results; it leads to the production of those painful and elaborate works with which we are all too familiar, patiently stippled to the last degree, marvels of painful and misdirected labor, but destitute of character and expression, and liable, however careful in parts, to remain unstudied and inaccurate as a whole. The too exclusive employment of the point as an instrument tends obviously in this direction; its range is limited, and it almost necessarily confines the attention to

a restricted field. The English system of schools of art, with the training school at South Kensington at their head, have fallen into this error. These schools have, in the course of fifteen or twenty years, raised the art manufactures of Great Britain from the lowest rank to nearly the highest; and if they have missed the success they might have reached, and if these works have failed to exhibit the higher artistic quality they might easily have attained, it is in great part due, it seems to me, to their exclusive preference for the point in drawing and to the system of drawing which this preference implies and involves. It is the object of the course of lessons you are now about to receive to supplement the deficiencies of the English methods in this particular. For in our own system of schools, and in this school especially, which stands at its head, it has been the intention from the outset, while profiting by the successes of the English system, to profit also by its failures, avoiding the errors which have limited its usefulness. It is hoped that the advantages of both may be secured for us by incorporating into the English system of organization and management the French system of drawing. For it may be said that, while in England they use the stump, when they use it at all, as if it were a hard point, in France they employ the point — and it is of course in frequent use — in the same spirit as they use charcoal or the stump. I think I cannot better conclude these remarks than by citing upon this point the emphatic testimony of one of the English art masters, sent to Paris by the English Government in 1867 to report upon the Continental systems of art education. The report * says: —

“This difference of feeling, which is observable in both fine and industrial art, between the English and Continental works, is not difficult to account for; the explanation of it is to be found in the very different degree to which drawing is taught generally in England and in France and Germany, but principally is it owing to the superior system upon which the subject is studied in France, at least, to what it is in England. . . . The French method is so opposite, and the results of the instruction, as seen in painting, architecture, sculpture, and industrial art, so far beyond all that we have done recently in England, that it would be well for us if, upon the basis of our English school of art method, we could engraft that element in the French (if we can only discover it) which gives such extraordinary mastery over drawing possessed by both their artists and workmen.”

“The most interesting study to an English art-master was the educational display in the French Court. Here, if at all, could be detected the secret of that power of drawing, before referred to, which is the chief characteristic of applied art in French manufactures, as well as in the fine art-works in architecture, painting, and sculpture. . . . Though the number of works was limited, there was sufficient to display what are the aims of the schools, and to allow of a fair judgment concerning the success which meets their efforts. The aim is very humble, the success distinguished. It is refreshing, after seeing the handsome drawings, nicely mounted, of the English and some

* Prize Report on the Art Educational Section of the Paris Exhibition of 1867. By Walter Smith, Head Master of the Schools of Art in Leeds, Bradford, and Wakefield. London, 1869.

German Courts, to see here the rough and roughly-presented studies of French students. Occasionally a moderately elaborate light-and-shade drawing from the antique was elevated to a place of honor on the walls of the French Court, but the great majority were in portfolios in the wooden bins, one of which was allotted to each school. Here, upon common paper, were numerous studies, some from the most execrable flat examples of ornamental design; others from casts of the antique of ornament and figure; and others from the living model, — all wrought in charcoal and crayon, rubbed and stumped in their general working, and many finished by spirited touches with the chalk point and enrichment of the deep shadows by the same means. The method of progression appeared to be from shaded flat copies to the cast, and from the cast to the living model. The first exercises were large details of ornament and animal forms, coarsely but effectively shaded in chalk, so that from the very beginning the student is taught that the end of his work is to get an effect of perfect realization in light and shade. This course of study I saw in operation in several of the municipal schools in Paris, both male and female, and can speak of it with the greatest admiration. Little boys, who with us would be languishing over outline drawing of difficult pieces of ornament, which they have to do for many weary months, in the French schools are working away deeply interested over their drawings in charcoal and chalk, studying the effect of roundness in their copy, and struggling hard to get it in their own drawings. Then I observed that though a student in England might work for weeks over an outline which is only a bad imitation of another outline done, as it were, by brute force, the French pupil either makes or mars his study in three or four evenings, and it is more or less an effort of his own feeling, his own spirit and knowledge. If he is in a low stage of perception of form or effect, he does his best honestly in that stage, and goes on quickly from it to something higher without stopping to affect in his work a refinement he does not feel, or waste his time in the mere mimicry of finish he cannot understand."

"It appears to me that this French method of teaching drawing is the one lesson which may be learnt by an art-educationalist from the Paris Exhibition. We see in all the French productions of art and industry, without exception, intense power and perfect facility of drawing, and we see in French schools of art a simple, easy way of teaching drawing, differing totally from all other methods displayed in the Exhibition, or that we know to exist. I do not attribute the brilliant artistic powers of Frenchmen wholly to the way in which they learn to draw; but I do say there is a definite connection between the two things, — the unique method of instruction and the attainment of unique and perfect drawing-power in art."

"Compared with the English school of art system, the French is deficient in breadth and comprehensiveness, and yet it gets more valuable results than the English does. . . . What we want in England is to engraft upon our system this French plan as to drawing, and then we should have absorbed, as it were, the soul of French art-education. It is, I am prepared to allow, a very rough and ready method, — all the more suitable, therefore, for students

who begin their studies with taste and power at zero ; but it has, on the other hand, capacity of development to suit the education of the most perfect taste and the maturest power. Some years ago the practice of working light-and-shade drawings with leather and stump as instruments, using chalk or charcoal as a medium, was entirely scouted in English schools of art. The examination and reports upon the French Art Schools' Exhibition by inspectors and masters of the English schools, in 1864, drew attention to the excellence of the method, and its adoption was very strongly advocated by at least one master. Since then, both in London and the provinces, several masters have partially adopted the system, and it was well represented in this year's national competition in London."

"What I propose to do is to see whether we cannot combine with our English art-education the good features by which the French and German educationalists try to develop art-feeling among the actual producers of the works."

The illustrations which accompany this paper are prepared by the heliotype process of Messrs. Osgood & Co. One page is made up from the drawings referred to in the text, most of which were made by students in the architectural department of the Institute of Technology. The bunch of fruit, however, shown in two stages at the foot of the page, was drawn by pupils of the Female School of Design at the Cooper Institute in New York, where a system of drawing is pursued substantially the same as that described in this paper, under the direction of Mrs. Susan N. Carter. The other illustrations are from drawings by Mrs. Carter herself, and are here reproduced by the kind permission of Messrs. Prang & Co., to whom they belong, and who are proposing to publish them in lithography as examples for drawing-schools. The four drawings of the vase exhibit the four principal stages of the work, beginning with the outline and going on to the indication of the principal masses of light and shade, the modelling of the light by graduated shading, and the modelling of the shade by the introduction of reflected lights. The head of Homer exhibits a late stage of a more difficult example, and illustrates the method of modelling by planes as described in the text.

ERRATA.

Page 77, line 36, for "Sir Charles" read *Charles L.*

137, line 42, for "choudrus" read *chondrus*.

139, line 2, for "lazetta" read *lagetta*.

139, line 23, for "Latechu" read *Catechu*.

139, line 27, for "sinaceæ" read *linaceæ*.

169, line 12, for "it" read *lead glass*.

171, line 18, for "a paint is mixed with it" read *a paint is mixed*.

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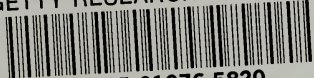
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